Medicine Bow
National Forest

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Roads Analysis Report

Medicine Bow
National Forest

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Executive Summary

Introduction

On January 12, 2001, the Forest Service issued the final National Forest System Road Management Rule. This rule revises regulations concerning the management, use, and maintenance of the National Forest Transportation System. The final rule is intended to help ensure that additions to the National Forest System road network are essential for resource management and use; that construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and that unneeded roads are decommissioned and restoration of ecological processes are initiated.

This report documents the information and analysis procedure used for the Medicine Bow National Forest roads analysis. This analysis is designed to provide decision-makers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions.

Roads analysis is a six-step process. The steps are designed to be sequential with an understanding that the process may require feedback and iteration among steps over time as an analysis matures.

1. Setting up the analysis
2. Describing the situation
3. Identifying the issues
4. Assessing benefits, problems and risks
5. Describing opportunities and setting priorities
6. Reporting (Key Findings)

The amount of time and effort spent on each step differs by project based on specific situations and available information. The process provides a set of possible issues and analysis questions; the answers can help managers make choices about road system management.

The product of this analysis is a report for decision-makers and the public that documents the information and analyses used to identify opportunities and set priorities for future national forest road systems. The key products of this roads analysis for subforest scale analyses include the following:

- A watershed risk assessment for all of the 6th-level watersheds on the forest.
- A map of all of the 6th-level watersheds on the forest that displays the results of the watershed risk assessment.
- A map that displays the existing level 3, 4, and 5 road system on the forest.
- A road risk versus value matrix that identifies 4 categories of roads that were evaluated on a road-by road basis.
- A road risk versus value graph based on the road matrix.
- A map of the potential minimum level 3, 4, and 5 road system for the forest.
- A narrative response to most of the 71 questions in Chapter 4.

During subforest scale roads analysis, the team should first review the watershed risk assessment, including watershed risk assessment maps. This review will help determine how roads may be affecting watershed health in the analysis area, and help guide road-related decisions that can address watershed health.

All classified and unclassified roads within the analysis area should be mapped and inventoried. The existing level 3, 4, and 5 road system map will help identify the roads system, but additional GPS field work may be necessary.

The team should then review, validate, and update the information in the road value versus risk matrix based on local knowledge of the level 3, 4, and 5 roads. Changes to the risk and values of these roads may result in changes to the road graph and the potential minimum level 3, 4, and 5 road system. The results of these road valuations can be used to develop road management alternatives for these roads, including relocation, upgrades, increasing or decreasing the maintenance levels, and possible decommissioning.

During Step 4 of the roads analysis, the team should review the forest scale responses to the 71 questions in this step. Where the forest scale responses do not adequately address the subforest scale analyses, the team should provide additional information. For example, at the subforest scale, the economic questions can better assess road-related costs and benefits. The road risk versus value matrix provides annual and deferred maintenance costs by individual road to help assess road-related costs for economic analyses.

The teams need to ensure that all road-related decisions from subforest scale roads analyses are documented in Road Management Objectives (RMO) and that all INFRA and GIS databases are subsequently updated.

Please see Chapter 5 for a more detailed explanation of guidelines and use of the roads analysis results.

Key findings

Shared maintenance is not occurring on key access roads.

- This issue was addressed with the Commissioners and Road and Bridge Superintendents of Converse, Carbon, Platte, and Albany Counties.
- The Forest should continue to pursue formal road maintenance agreements with the counties interested in sharing maintenance to more efficiently use taxpayer funds.

There is not enough legal public access to the Forest.

- There is insufficient access into the northeastern part of the Snowy Range division. In the Laramie Peak division, the fragmented landownership pattern restricts public access.

Some roads are not under appropriate jurisdictions.

- A preliminary review of the database shows several roads listed under questionable jurisdictions. However, this was based on data that had not been updated as the Forest acquired legal jurisdiction on roads. Efforts to update and correct the data files should continue.

Road maintenance funding is not adequate to maintain and sign roads to standard.

- Even with the focus on potential minimum road system, our current budgets don't cover road maintenance costs. The Medicine Bow National Forest currently receives approximately $800,000 per year for all road maintenance. To maintain the level 3, 4, and 5 road system to standard would cost approximately $3.5 million.
- Using the subforest level roads analysis process could result in continued reductions of the Forest road maintenance obligations through decommissioning of level 1 and 2 roads.

Road access may not be adequate for future management needs.

- Arterial and collector roads are not being maintained to the standards specified in the 1985 Forest Plan. The road system will continue to degrade, and this will compromise future access on existing roads.
- The timber program still has additional road access needs to meet the 1985 Forest Plan and may very well have additional road needs under the revised plan. There may be future access needs for other management activities.

There are potential environmental impacts from the road system that need to be prioritized and evaluated for future analyses at a subforest level scale.

- This roads analysis process identified individual roads that represented high potential for environmental risks. Categories 2 and 3 from the Road Risk-Value Graph identified approximately 264 miles of these roads. The watershed risk table (Appendix A) identifies watersheds most at risk.
- Chapter 4 provides more information in response to this issue.

High road densities in some areas of the Forest are causing impacts to resources and users.

- By itself, the level 3, 4, and 5 road system was not a road density concern.
- Most of these high road density areas are areas where there are many unclassified roads and level 1 and 2 roads.

The public was concerned about road-related decisions being made without public involvement.

- Decisions that will change the existing system will occur through public involvement and a site-specific analysis that considers effects on existing roads or roads proposed for addition, deletion, or reconstruction in the future.

Introduction

Background

In August 1999, the Washington Office of the USDA Forest Service published Miscellaneous Report FS-643 *Roads Analysis: Informing Decisions about Managing the National Forest Transportation System*. The objective of roads analysis is to provide decision-makers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions.

In October 1999, the agency published Interim Directive 7710-99-1 authorizing units to use, as appropriate, the road analysis procedure embodied in FS-643 to assist land managers making major road management decisions. The Rocky Mountain Region of the Forest Service then published a roads analysis guidance document as a supplement to Appendix 1 of FS-643. This document provides guidance concerning the appropriate scale for addressing the roads analysis.

On March 3, 2000, the Forest Service proposed to revise 36 CFR Part 212 to shift emphasis from transportation development to managing administrative and public access within the capability of the lands. The proposal was to shift the focus of National Forest System road management from development and construction of new roads to maintaining and restoring needed roads and decommissioning unneeded roads within the context of maintaining, managing, and restoring healthy ecosystems.

On January 12, 2001, the Forest Service issued the final National Forest System Road Management Rule. This rule revises regulations concerning the management, use, and maintenance of the National Forest Transportation System. Consistent with changes in public demands and use of National Forest System resources and the need to better manage funds available for road construction, reconstruction, maintenance, and decommissioning, the final rule removes the emphasis on transportation development and adds a requirement for science-based transportation analysis. The final rule is intended to help ensure that additions to the National Forest System road network are those deemed essential for resource management and use; that construction, reconstruction, and maintenance of roads minimize adverse environmental impacts; and that unneeded roads are decommissioned and restoration of ecological processes are initiated.

Process

Roads analysis is a six-step process. The steps are designed to be sequential with the understanding the process may require feedback and iteration among steps over time as an analysis matures. The amount of time and effort spent on each step differs by project based on specific situations and available information. The process provides a set of possible issues and analysis questions for which the answers can help managers make choices about road system management. Decision-makers and analysts determine the relevance of each question, incorporating public participation as deemed necessary. The following six steps guided the process.

Step 1. Setting up the analysis

Step 2. Describing the situation

Step 3. Identifying the issues

Step 4. Assessing benefits, problems and risks

Step 5. Describing opportunities and setting priorities

Step 6. Reporting (Key Findings)

Products

The product of an analysis is a report for decision-makers and the public that documents the information and analyses used to identify opportunities and set priorities for future national forest road systems. Included in a report is a map displaying the known road system for the analysis area, and the risks and opportunities for each road or road segment. A report may also include other maps and tables necessary to display specific priorities and changes in a road system.

The Forest Supervisor specifically asked the project team to provide the following information in this analysis report (3/27/01 internal memo):

- An inventory and map of all maintenance level 3, 4, and 5 (generally open to passenger cars) roads and a description of how those roads are to be managed.
- Guidelines for addressing road management issues and priorities related to construction, reconstruction, maintenance, and decommissioning.
- Significant social and environmental issues, concerns, and opportunities to be addressed in project-level decisions.
- Documentation of the coordination efforts with other governmental agencies and jurisdictions.

This Report

This report documents the information and analysis procedure used for the Medicine Bow National Forest roads analysis. The report contains a table rating each road for recreation values, resource values, watershed risks, and wildlife risks. It contains management guidelines and opportunities for future actions that will impact the Forest roads system. It includes a map of the Forest, the four geographic divisions analyzed in the report, and the ranger district boundaries. It also includes geographic division maps with the existing maintenance level 3, 4, and 5 roads system and geographic division maps with the potential minimum level 3, 4, and 5 roads system.

Chapter 1 Setting up the analysis

Objectives of the Analysis

Establish the level and type of decision-making the analysis will inform

The roads analysis project will be used to support the Medicine Bow Forest Plan Analysis of the Management Situation (AMS) and subsequent subforest scale and project analyses. It is intended to identify prioritized opportunities which address watershed health or road maintenance. It will also be used in developing forest wide standards and guidelines and geographic area direction for the forest plan revision effort.

Identify Scale/Analysis Area

The analysis will:

- Be at the forest scale for the Medicine Bow National Forest (1.1 million acres) in southern Wyoming, Region 2 of the National Forest System
- Concentrate on maintenance level 3, 4, and 5 roads, though levels 1 and 2 may be used for some specific resource analyses.
- Be analyzed to some extent on four geographic divisions; Sierra Madre, Snowy Range, Pole Mountain, and Laramie Peak
- Be spatial or Geographic Information System (GIS)-based whenever possible.
- Use only existing information.
- Use information and data that is consistent with that used in the Medicine Bow Forest plan revision effort.

Interdisciplinary Team Members and Participants

The Core Interdisciplinary Team and their specialties:

Rob Schmitzer, Team Leader	Engineering/Recreation Staff	Douglas Ranger District
Robin Brooks	GIS Specialist	Douglas Ranger District
Tom Cartwright	Wildlife/TES Program Mgr.	Supervisor's Office
Liz Schnackenberg	Hydrologist	Supervisor's Office
Gary Roper	Timber Program Manager	Supervisor's Office
Steve Coupal	Forest Transportation Engineer	Supervisor's Office
Mary Sanderson	Recreation Specialist	Supervisor's Office

Extended team members and their specialties:

Greg Eaglin	Fisheries Biologist	Supervisor's Office
Leslie Horsch	Writer-Editor	Supervisor's Office
Pat Harrison	Public Affairs Officer	Supervisor's Office
Tommy John	Soil Scientist	Supervisor's Office
Sue Struthers	Archeologist	Supervisor's Office
Bob Mountain	Range, Noxious Weeds	Supervisor's Office
Robin McCartney	GIS Specialist	Chippewa NF – Region 9
Jeff Tupala	Landscape Architect	Supervisor's Office
Dean Lebeda	Engineering	Laramie Ranger District
Tom Florich	Lands, Minerals, Special Uses	Supervisor's Office

Analysis Plan

The main analysis process considered all 702 miles of maintenance level 3, 4, and 5 roads in the Forest roads database. It was a two-step, integrated approach that considered issues, data, and information and systematically addressed all roads in a single analysis.

Step 1 considered the following:

- Issues.
- Road location (miles of road and roads that crossed two or more geographic divisions).
- Annual and deferred maintenance costs.
- Recreation use values.
- Resource management values.
- Watershed risk.
- Wildlife risk.

The interdisciplinary team (IDT) factored all of the items listed and assigned a low, medium, or high value rating to recreation use and resource management. The IDT also assigned a low, medium, or high risk rating for watershed risk, wildlife risk, and road maintenance costs to each of the roads in the system

In Step 2, the IDT grouped the two value ratings into a single low, medium or high rating and grouped the two risk ratings into a single low, medium or high rating. This resulted in each road having a set of descriptive coordinates that indicated their value and risk (e.g., high value, low risk). The descriptive coordinates for each road were plotted on a graph with four quadrants representing the following categories:

- Category 1 – High Value, Low Risk
- Category 2 – High Value, High Risk
- Category 3 – Low Value, High Risk
- Category 4 – Low Value, Low Risk

The results of this exercise are listed in the Road Management Category column in Appendix C – Road Matrix Table. High and low values and high and low risks were easy to plot into their associated quadrants. Medium Values and Medium Risks were collected along an x-axis or y-axis and defaulted into the adjacent quadrant so that effectively no medium categories were possible in the final allocation (see Road Risk-Value Graph, page 83, for final results)

Once the roads were assigned into one of the four categories, recommendations for future actions could be limited to those four categories. This simplified the final product and made it possible to map the possible future road system in total and by geographic division.

IDT members conducted resource-specific analyses to derive the data that appears in the Road Matrix (e.g., watershed risk, recreation use value) and the information to answer the questions in Chapter 4 – Assessing Benefits, Problems, and Risks.

Information Needs

The IDT identified the following information sources to use for the analysis:

- Medicine Bow Travel Management Environmental Assessment and Decision Notice.
- Social assessment for Medicine Bow plan revision.
- Deferred maintenance costs in INFRA.
- INFRA travel routes.
- Potential Public Forest Service Road (PFSR) project submittals.
- Suitable Timber Base for the 1985 Medicine Bow Forest Plan.
- Roadless area inventory for the Medicine Bow plan revision.
- Range of Natural Variability assessment for the Medicine Bow plan revision, currently under peer review.
- Economic assessment for Medicine Bow plan revision.
- Biological diversity report by Judy Von Ahlefeldt.

The IDT also identified the following GIS base map needs:

- Roads (all).
- Trails.
- 6^{th}-level watersheds.
- Streams and riparian areas.
- Geological hazards.
- Soil map units.
- Management Area prescriptions from 1985 Forest Plan.
- Recreation Opportunity Spectrum (new inventory).
- Developed recreation sites.
- Land status.
- Occurrence of threatened and endangered species.
- Research Natural Area and Special Interest Area maps from Medicine Bow plan revision.

The IDT discussed the use of newer wildlife models but decided against it. The newer wildlife models will be used in the forest plan revision and then to implement recommended actions in the roads analysis.

The IDT also identified the following information that could be used in the analysis process:

- Wyoming Department of Transportation traffic counts.
- Wyoming Game and Fish hunter numbers to identify roads most likely to be important to hunters.

Public Involvement

Communications Plan

The IDT was concerned about the possibility of public confusion on what this forest scale Roads Analysis Process was and was not. Since the process would not involve an action proposal resulting in a decision, it would be difficult to collect public input at the forest scale. The team agreed upon the following strategy, which is contained in the full Communications Plan in the administrative record for this analysis.

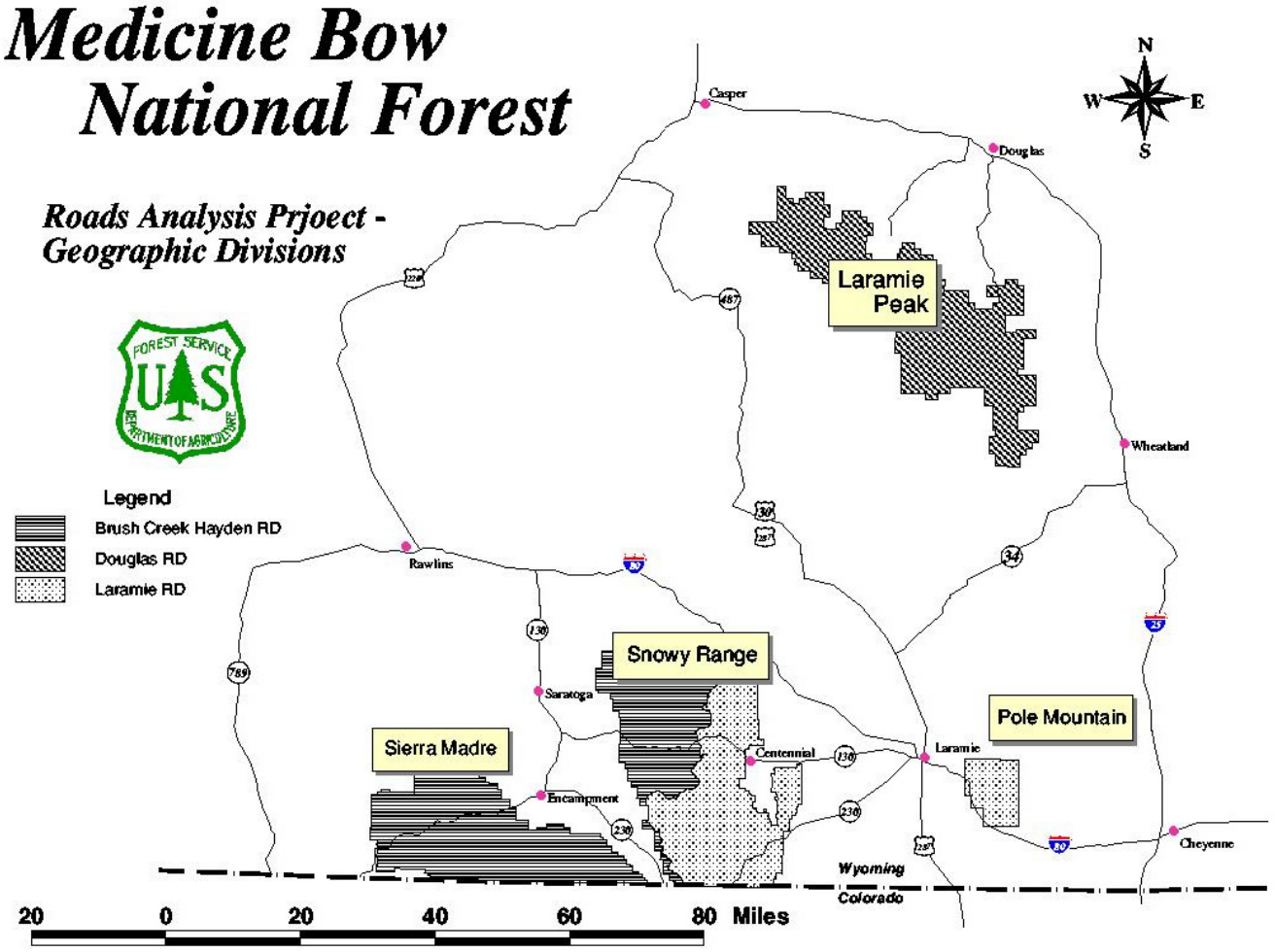
The tone of this communication effort was low-key, informative, aimed at stakeholders with a direct and meaningful interest in National Forest road system management. This was appropriate for three main reasons. First, this is not a NEPA analysis requiring a legally mandated level of public scoping and involvement (that will come later, when road-specific decisions are made). Second, this effort was intended to be completed in two months, necessitating an adequate, but not over-done, public involvement effort. Finally, numerous public scoping efforts related to road and travel management have preceded this analysis. An adequate base of knowledge about public issues already exists; it will be used to identify opportunities.

The Communications Plan for this assessment identified the County Commissioners and County Road and Bridge Superintendents as the key contacts for public involvement. The ID team felt that the commissioners and road and bridge superintendents are the county representatives who have the actual road management knowledge and information that could be useful in identifying mutual (county and Forest Service) opportunities and issues. Albany, Carbon, Converse, and Platte were the key counties identified for making these contacts.

Public Contacts

From May through July of 2001, Laramie District, Brush Creek Hayden District, and Douglas District employees contacted Commissioners and Road and Bridge Superintendents from Albany, Platte, Converse, and Carbon counties. Some of these were formal contacts, with the District Ranger and/or IDT Leader making presentations at monthly Commissioner meetings. Some were more informal, with the District Ranger and/or Forest Transportation Engineer making contacts with individual Commissioners or Road and Bridge Superintendents. Forest Service representatives explained the Roads Analysis Process, provided copies of the January 12, 2001 Federal Roads Policy and Rule, and discussed mutual road-related issues and potential opportunities. In addition, the Commissioners were asked to review the already identified issues, clarify them if necessary, and offer any new issues.

The County Commissioners were most interested in opportunities to conduct road maintenance through cooperative agreements with the Medicine Bow National Forest when the activities would be mutually beneficial. Albany County has the greatest opportunity for sharing road maintenance activities with the National Forest. Platte County has few opportunities due to limited numbers and miles of National Forest roads that cross county lands but is interested in a three-way sharing opportunity that includes Albany County, Platte County, and the Forest. Opportunities for such cooperative agreements exist predominantly in the Snowy Range Geographic Division.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Encampment
Centennial
Laramie
Pole Mountain
Cheyenne
Wyoming
Colorado
20 0 20 40 60 80 Miles

Chapter 2 Describing the situation

The Analysis Area

The area addressed in this roads analysis is not a contiguous land unit. The Medicine Bow National Forest is located in southeast Wyoming. It is made up of three mountain ranges: Laramie, Medicine Bow, and Sierra Madre. The climate varies from semi-arid in the lower elevations to cool and humid in the high elevations. Well-known attractions include the Snowy Range Scenic Byway, distinctive rock formations at Vedauwoo, and the granite walls of La Bonte Canyon. The Forest is divided into 4 distinctly separate areas or divisions: Pole Mountain, Laramie Peak, Snowy Range, and the Sierra Madres (see map on facing page). Interstate, state, and county road systems connect the areas.

Pole Mountain

Pole Mountain unit or division is a military reservation of approximately 56,000 acres that was relinquished to National Forest management many years ago. It is characterized as a well-roaded unit that has aspects of being a large recreational park for the cities of Cheyenne and Laramie, Wyoming. Significant numbers of recreationists use the road system in summer, fall, and spring. Many roads are snowed in during the winter. However, the open highway system transports large number of recreationists to cross-country skiing trailheads. A prominent transportation feature is Interstate 80 (I-80) which transects the southwest portion of the unit. Another prominent year-round feature is Wyoming State Highway 210, Happy Jack Road, which is a popular recreational, scenic driving route between the two cities.

Laramie Peak

The Laramie Peak division in northern Albany County has approximately 420,000 acres of intermingled NFS lands, state lands, and private holdings, with larger blocks of NFS ownership at Laramie Peak, La Bonte/Sawtooth Mountain, Buffalo Peak, and Upper Horse Creek. The mixed land ownership in this division is integrally tied to county roads in Albany, Platte, and Converse counties. Many of the lower maintenance level roads are surfaced with decomposed granite.

Snowy Range (Medicine Bow Range)

The Snowy Range Geographic Division has approximately 530,000 acres inside the proclaimed National Forest boundary. It is practically entirely in NFS lands/jurisdiction. There are a few private land inclusions, mostly from patented mining claims. The road system has long been established; early roads even predated formation of the National Forest. The road system has had additions and upgrades through the years to the present. Arterial, collector, and local roads have been added, with numerous additions in the 1970s. Road construction continued into the 1980s. Few roads were added in the 1990s.

Sierra Madre

The Sierra Madre unit or division corresponds to the "Hayden Division" which was identified during the formation of the Medicine Bow National Forest in the early 1900s. This division had tie-hacking activities during the early days, but was not roaded to the same extent as the Snowy Range division. The Wyoming–Colorado state line was an informal but locally sanctioned "dead-line" for sheep on the Wyoming side, cattle on the Colorado side. Much of the access was via sheep driveways on the Medicine Bow Forest (Wyoming side). These driveways were not on grades or alignments that subsequently developed into arterial or collector roads. Much of the division was sparsely roaded until Hog Park Reservoir and its access roads were constructed in the 1970s.

The National Forest Transportation System

General Description

The transportation system on the Medicine Bow National Forest serves a variety of resource management and access needs. Most roads on the Forest were originally constructed for commercial access purposes including grazing, timber, and mineral extraction. Others resulted from construction of water storage and transmission projects for municipal water supplies. Over the past 100 years, an extensive road network has been developed and continues to serve commercial, recreation, and administrative purposes and provide access to private lands.

There are two goals for the transportation system in the 1985 Medicine Bow Forest Plan:

- Develop a transportation system that meets land and resource management needs at lowest cost and least disturbance to the environment.
- Manage motorized travel on the transportation system and off-roads to protect land and resource values at lowest cost and with a minimum of regulations.

Meeting these goals is measured by the miles of road construction, reconstruction, and decommissioning (physical closures).

There are currently 2,592 miles of inventoried, classified[1] National Forest System (NFS) roads on the Medicine Bow National Forest transportation inventory. The three ranger districts, Brush Creek/Hayden, Laramie, and Douglas, share management of the road system. The Wyoming counties of Albany, Carbon, Converse, Natrona, and Platte have roads which are within or provide public access to the National Forest.

Thirty percent (701 miles) of the NFS roads are managed and maintained for public use with low-clearance vehicles (passenger cars). These roads receive the highest traffic and are the most costly to maintain to standard. They are the focus of this forest scale roads analysis.

NFS roads are maintained to varying standards depending on the level of use and management objectives. There are five maintenance levels (also referred to as levels) used by the Forest Service to determine the work needed to preserve the investment in the road. These maintenance levels are described in *FSH 7709.58 – Transportation System Maintenance Handbook*. Levels 3, 4, and 5 provide access for passenger car traffic and make up the backbone of the Forest transportation system. The following table summarizes the miles of level 3 through 5 roads under Forest Service jurisdiction.

[1] Classified roads are wholly or partially within or adjacent to NFS lands that are determined to be needed for long-term motor vehicle use, including state roads, privately owned roads, NFS roads, and other roads authorized by the Forest Service.

Table 1. Maintenance level 3, 4, and 5 roads (USFS jurisdiction) by geographic unit (miles).

Maintenance Level	Sierra Madre	Snowy Range	Pole Mountain	Laramie Peak	Forest Total
3	161.8	219.0	24.7	45.2	450.7
4	55.7	172.4	22.9	0.0	250.0
5	0.4	0.1	0.0	0.0	0.5
Total	216.9	391.5	47.6	45.2	701.2
	31%	56%	7%	6%	100%

The remaining 1,891 miles of inventoried NFS roads are either restricted to motor vehicle traffic use (maintenance level 1) or managed only for high-clearance vehicles such as pickup trucks and four-wheel drive vehicles (maintenance level 2). These roads are single-purpose, low volume roads normally single-lane and unsurfaced.

Other roads (unclassified[2]) on National Forest System land have been identified in the field and added to the Forest transportation inventory. There are 807 miles of these unclassified roads. The majority of these roads have been created by off-road vehicle traffic. These roads are awaiting management decisions on whether or not to include them as part of the transportation system or to decommission or restrict them to further use. The analysis for these decisions will be made at the watershed or project scale.

Meeting Forest Plan Objectives

Appendix C in the 1985 Forest Plan is a schedule of planned arterial and collector road construction and reconstruction for the planning period. Arterials and collectors are the roads used to provide primary access to large portions of the national forest. Arterials normally serve as connections between towns, major county roads or state highways and are main thoroughfares through the Forest. Collectors link large areas of the Forest to arterials or other main highways. A total of 48.4 miles of new construction and 152.7 miles of reconstruction were planned. To date, 25.8 miles of construction and 63.7 miles of reconstruction have been accomplished. This is approximately 45% of the planned accomplishments. Declining timber sales and reduced capital investment programs are the primary reasons for not meeting forest plan expectations. Also not all roads listed in the Plan are still classified as arterial or collector. Some are level 2 and 3 roads for timber sale access that were not built or built to a lower standard than originally planned. Other projects were dropped because management objectives for the roads changed in response to public comments.

General direction in the 1985 Forest Plan (page III-8) states that the minimum maintenance level for all arterial roads is at least level 3 and the minimum maintenance level for all collector roads is level 2. According to the current inventory, the Forest is not meeting this direction. Maintenance levels of Forest arterial and collector roads are shown in the following table.

[2] Unclassified roads are roads on NFS lands that are not managed as part of the Forest transportation system (unplanned roads, abandoned travelways, and off-road vehicle tracks that have not been designated and managed as a trail, and those roads that were once under permit or other authorization and were not decommissioned upon termination of the authorization).

Table 2. Inventoried maintenance levels of Forest arterial and collector roads (miles).

Maintenance Level	Arterial	Collector
1	0	33
2	9	129
3	87	167
4	104	49
5	0	0
Total Miles	**200**	**378**

According to the current inventory, 42 miles of arterial and collector roads are not being maintained to the level directed by the 1985 Forest Plan. The following table lists the roads not meeting this direction:

Table 3. Arterial and collector roads not maintained to forest plan standards.

Road Number	Name	Maintenance Level	Functional Class	Geographic Division
629	Box Elder Road	2	Arterial	Laramie Peak
323	Rock Creek Circle	1	Collector	Snowy Range
326	Rock Creek Knoll	1	Collector	Snowy Range
416	Coon Creek	1	Collector	Sierra Madre
421	Big Boulder	1	Collector	Sierra Madre
439	Shingle Creek	1	Collector	Sierra Madre
449	Cherokee Creek	1	Collector	Sierra Madre
450.1D	North Spring Cr. Spur 1D	1	Collector	Sierra Madre
451	North Savery Road	1	Collector	Sierra Madre
457	Evie	1	Collector	Sierra Madre
460	Dead Deer	1	Collector	Sierra Madre
461	Jack Creek Mine Road	1	Collector	Sierra Madre
809	Little Snake	1	Collector	Sierra Madre

Federally Designated Forest Highways and Scenic Byways

The analysis area contains three Forest Highways designated under the Public Lands Highways program of the Transportation Equity Act for the 21st Century (TEA21). These routes are state, county, or Forest Service owned roads qualifying for federal funding for improvement or enhancement. They provide access to and within the National Forest. These roads are listed in the following table:

Table 4. Federally designated Forest Highways.

Forest Hwy Number	Route Name	Description of Termini	County	Length (miles)
11	Battle Lake Road	State Hwy. 789 – State Hwy. 230	Carbon	57
12	Snowy Range Road	State Hwy. 230 – St. Hwy. 11	Carbon / Albany	47
26	Sage Creek Road	State Highway 70 - Rawlins	Carbon	55
29	Douglas-Esterbrook Rd	Albany/Converse County Line – I-25	Converse	29

Forest Highway funding can be used for planning, design, and construction or reconstruction of these designated routes. Other work can include parking areas, interpretive signing, acquisitions of scenic easements or sites, sanitary and water facilities, and pedestrian and bicycle paths. The Snowy Range Road was also designated as a National Forest Scenic Byway in 1988.

Budget

The Forest budget allocation for planning, construction, and maintenance of roads has been averaging $2,055,000 per year from 1997 to 2001. There has been an increasing trend in the funding level for roads. However, the annual cost to maintain the entire road system to standard is considerably higher than the amount allocated by Congress. In prior years, congressionally appropriated road funding was supplemented by road construction and maintenance work performed by timber purchasers through the commercial timber sale program. This program has declined steadily and is a mere fraction of the program of a decade ago.

From 1998 through 2000, the Forest conducted road condition surveys to determine the actual cost of maintaining the road system to standard. Work items were also recorded to determine the cost of road maintenance work deferred in previous years due to lack of funding. Finally, road improvement work necessary to bring the roads up to the desired objective was identified and documented. Upon analysis of the data collected, it becomes obvious that the Forest is substantially underfunded for the size of the road system it manages (see table below).

Table 5. Summary of needed funds for road maintenance and operations.

Maint. Level	Total Miles	Annual Maintenance		Deferred Maintenance		Capital Improvements	
		$/mile	Total $	$/mile	Total $	$/mile	Total $
1	693.7	$382	$264,993	$2,332	$1,617,708	$0	$0
2	1,197.1	$454	$1,570,193	$2,182	$2,612,395	$0	$0
3	450.7	$4,692	$2,114,908	$28,151	$12,687,456	$680	$306,476
4	250.0	$5,469	$1,367,231	$36,348	$9,086,965	$2,094	$523,440
5	0.5	$20,558	$10,279	$24,220	$12,110	$0	$0
Total	**2,592**		**$5,327,604**		**$26,016,634**		**$829,916**

Source: 1998-2000 Road Condition Surveys

Due in large part to this funding shortfall, there is a need to identify and prioritize the minimum road system necessary for access to and management of the National Forest.

Chapter 3 Identifying issues

Identifying Issues

Issues were generated from public response to the Notice of Intent to revise the Medicine Bow National Forest Plan (2000), the Medicine Bow Travel Management EA (2000), local knowledge of the roads analysis ID team members, public response to a variety of project proposals, and discussion with other public agencies. The Forest Supervisor reviewed and accepted the following issues with the exception of two public-generated issues #8 (Forest scale) and #4 (subforest scale). The issues were sorted into two categories: forest scale and subforest scale. The forest scale issues will be addressed through this roads analysis project. Subforest scale issues will be recommended for addressing at a scale below the forest level. Examples of subforest analyses are watershed or geographic area assessments or specific project proposals.

Forest Scale Issues

1) Shared road maintenance is not occurring on key access roads. Currently there are no road maintenance agreements between the Forest Service and the counties.
   - Heavy log truck traffic from National Forest System roads onto some arterial county roads results in increased maintenance needs straining the resources of the counties.
   - Road maintenance operations by the counties and Forest Service could be more efficient if shared maintenance agreements were in place.
   - Some primary county roads that access National Forest lands could be designated as Forest Highways to become eligible for Federal Highway Administration funding.
2) There is not enough legal public access to the Forest (Forest Plan Revision Problem Statement 10).
   - Many National Forest System roads that provide access to scattered parcels of NFS lands cross privately owned lands. The Forest Service does not have legal rights-of-way on many of these roads. Therefore, access to NFS lands is often unavailable to individuals who do not have permission to travel on the portions of the roads that cross private lands.
3) Some roads may not be under the appropriate jurisdictions.
   - Some roads have been under Forest Service jurisdiction for many years. Due to changing use, it might be more appropriate for them to be under county jurisdiction. For some roads, the reverse situation may exist.
4) Road maintenance funding is not adequate to maintain and sign roads to standard.
   - One of the objectives of the Roads Analysis Process is to identify the minimum road system needed for public access and land management purposes. Congressionally appropriated road maintenance funding is approximately 20% of what is needed for the current system.
   - Directional, warning, and road number signing needs to meet legal standards. Some National Forest System roads do not meet the standards.
   - With limited funding, we need to focus on high priority areas: a) implementing the 2000 Medicine Bow National Forest Travel Management decision by addressing geographic area travel concerns, b) acquiring rights-of-way, c) addressing road jurisdiction needs, d) performing road maintenance and e) conducting subforest scale roads analysis to identify unneeded roads and maintenance opportunities.

Forest Scale Issues, cont.

5) Road access may not be adequate for future management needs.
   - The arterial and collector road system on the Forest was developed over several decades to access different portions of the Forest, often to manage different resources and provide for a variety of public uses. It was not planned forest-wide. This roads analysis will identify opportunities for comprehensive transportation planning.

6) There are potentially adverse environmental impacts from the current road system. Roads causing adverse impacts should be prioritized for evaluation at a subforest level scale.
   - Scientific studies and documentation in the past decade have revealed a number of adverse environmental impacts caused by roads.

7) High road densities in some areas of the Forest are causing adverse impacts to resources and users.
   - High road densities, especially roads open to motorized vehicles, are fragmenting habitat for some species, degrading the quality of big game hunting, creating conflict between nonmotorized and motorized users, and may be affecting watershed health in some areas.

8) The public was concerned that decisions about reducing or reconfiguring the Forest's transportation system might be made without the benefit of public involvement. Forest roads are an integral part of the entire public road system on the Forest. People rely on them to drive to their jobs, recreate on the Forest, to visit friends and relatives and for many other purposes. Decisions that will change the existing system will occur through public involvement and a site-specific analysis that considers effects on any roads in the system now or proposed for addition or deletion from the system in the future.

Subforest Scale Issues

1) Road restrictions (permanent and seasonal) are not always coordinated with affected public agencies.

2) Forest access for winter recreation may not be adequate.
   - Increasing snowmobile and cross-country ski use in some areas of the Forest is creating parking congestion problems and safety concerns and may be limiting the number of users and kinds of use. Better access to these heavily used areas needs to be planned and built.

3) Both small all-terrain vehicles (ATVs) and highway vehicles are used on the same roads and occasionally at the same time. This can be a safety problem.
   - Limited sight distance is creating a safety problem on some roads. Limited road maintenance funding to increase sight distance (e.g., reconstruction or roadside clearing) has been a problem.
   - Wyoming State Statute permits use of "public roads" by ATVs that are registered as motorcycles with licensed operators. Many ATVs driven on forest roads are not registered, and many riders are not licensed operators. Medicine Bow National Forest employees have had near-miss experiences with unlicensed operators or operators driving unregistered ATVs. In some cases, the ATV operators were going too fast or were inexperienced. While the issue of licensing operators and registering all-terrain vehicles is outside the scope of this analysis, the concern about safety is not.

Subforest Scale Issues, cont.

4) One very specific issue was discussed with Converse County Commissioners. This issue concerns the condition of the Box Elder Road, FS Road 629. This road connects the end of the county Box Elder Road in the northwest part of the Laramie Peak Geographic Division with the Basin Road, FS Road 660, to the south. The Forest Service obtained an easement on most of Road 629 in 1997. This easement included an agreement to maintain the road at a maintenance level higher than 2, which was the level it had been maintained at prior to granting the Forest Service an easement. The road provides access to several summer residences and a few year-round use homes. Due to limited funding for road maintenance, the road has not been maintained at the level required by the easement. The Douglas district may need to review the 1997 decision and resulting easement to determine how to address the road maintenance issues along the Box Elder Road.

Chapter 4 Assessing benefits, problems, and risks

Introduction

For the purpose of this roads analysis, the June 11, 2001 version of the R-2 Roads Analysis Supplement to FS-643 was used as the guideline for this step. This guideline document provides direction and suggestions about the best scale at which each question could be answered. The IDT used the overall guidance provided but decided it would attempt to answer most of the questions at the forest scale to provide at least background information for each question for referencing and citing purposes during subforest scale roads analyses.

Current Road System Benefits, Problems, and Risks

Aquatic, Riparian Zone, and Water Quality

Analysis of the aquatic questions in this forest scale roads analysis focuses on identifying watersheds where there is a high risk of watershed function and/or aquatic species being affected by the road system. This will help prioritize those watersheds on which to focus sub-forest analyses. For this reason, all inventoried roads were considered, including all classified roads (maintenance levels 1-5) and all unclassified roads that have been inventoried and are in the database. Looking at all the roads allowed a broad-scale assessment of the risk to watershed function associated with the entire road system rather than just the arterials and collectors. The broad forest scale analysis provides the basic framework for watershed or project level analysis. Subforest scale analyses will identify site-specific areas being affected by the road system and opportunities to address these concerns.

Map analysis was used to determine which level 3-5 roads are at the highest risk of degrading water quality. These roads are identified in the road matrix.

AQ1: How and where does the road system modify the surface and subsurface hydrology of the area?

Roads expand the channel network, convert subsurface flow to surface flow, and reduce infiltration on the road surface. All of these factors affect the overall hydrology in a watershed, particularly the quantity and timing of flow.

The channel network is expanded by road ditches, which create stream channels in previously unchannelized portions of the hillside. Road ditches also intercept subsurface flow and convert it to surface flow. An expanded channel network augments peak flows since water traveling as concentrated surface flow reaches the channel faster than water traveling as subsurface flow (Wemple et al. 1996). Reduced infiltration contributes to additional surface flow since water does not infiltrate for storage in the soil profile, but rather runs off as overland or surface flow. Storage and movement of water through the soil profile as subsurface flow regulates and sustains baseflows. When roads disrupt these processes, more water becomes available during peak flows, and less water is available to sustain baseflows.

While the effects of roads on the hydrology of an area depend largely on local factors, road density is an indicator of the road system's relative potential for modifying surface and subsurface hydrology; the higher the road density, the greater the potential for the road system to affect the hydrology. Road density was calculated for each 6th-level watershed, and watersheds were classified as having extreme, high, medium, or low potential for hydrological effects based on relative road densities (see Appendix A – Watershed Risk Assessment). The aquatic specialist report identifies the range of values, which represent the low, moderate, high, and extreme ratings for road densities as well as other parameters used in questions AQ 1-4, AQ 6, and AQ 9. The following table shows the ratings by watershed for each factor.

Laramie Peak division: Although none of the 6th-level watersheds in the Laramie Peak area had high road densities, the hydrology of the area must be considered. In this division, intense summer thunderstorms cause high runoff events. With the high percent of rock in this area, there is little infiltration during storm events, which results in flashy runoff events. During these runoff events, all of the roads act as flow pathways, which accelerate delivery of water to the stream network. Due to these processes, the Laramie Peak unit is different from the other three units. In this division, roads become part of the stream network and affect the surface and subsurface of the hydrology in most cases.

Pole Mountain, Sierra Madre, and Snowy Range divisions: The hydrology of the Pole Mountain, Sierra Madre, and Snowy Range divisions are more snowmelt dominated. While the road system still affects the surface and subsurface flows during spring snowmelt, these effects occur only in the spring and during major thunderstorm events, which tend to have a lower occurrence interval with less impact than those in the Laramie Peak division. The following table shows the number of watersheds with high or extreme road densities for the Pole Mountain, Sierra Madre, and Snowy Range mountain ranges.

Table 6. Number of 6th-level watersheds with high or extreme road density ratings by mountain range.

Mountain Range	# of 6th-level watersheds	# with high road density ratings	# with extreme road density ratings	% with high or extreme road density ratings
Pole Mountain	12	3	3	50%
Sierra Madre	47	10	0	21%
Snowy Range	60	20	3	38%

The following is a list of opportunities/recommendations to consider if roads are likely to modify surface and subsurface hydrology:

- Design roads to minimize interception, concentration, and diversion potential.
- Design measures to reintroduce intercepted water back into slow subsurface pathways.
- Use outsloping and drainage structures to disconnect road ditches from stream channels rather than delivering water in road ditches directly to stream channels.
- Evaluate and eliminate diversion potential at stream crossings.

AQ2: How and where does the road system generate surface erosion?

Surface erosion is highly dependant on soils, road surfacing, road grade, age of the road, traffic volumes, and the effectiveness and spacing of drainage structures. The greatest surface erosion problems occur in highly erodible terrain, particularly landscapes underlain by granitic or highly fractured rocks (USFS 2000). Studies have found that sediment delivery to stream systems is highest in the initial years after road construction, although raw ditchlines and road surfaces with little binder can remain chronic sources of sediment.

Drainage structure, function, and spacing are key to minimizing the amount of surface flow, which directly affects surface erosion. The Water Conservation Practices Handbook (FSH 2509.25) provides guidelines for drainage structure spacing. Drainage structures should be close together on silt-sand soils with little to no binder on steep slopes and further apart on gravel road surfaces with moderate binder and little to no fines on flat or minimum grades.

To evaluate surface erosion potential, we determined the amount (percent of the watershed) of soils with high erosion potential and miles of road on highly erodible soils in each 6th-level watershed (see Appendix B – Sensitive Soils Analysis). Watersheds were determined to have a high, medium, or low risk of water quality effects from surface erosion (Appendix B – Sensitive Soils Analysis). The density of road-stream crossings and the density of road miles within 200 feet of a stream were used as secondary indicators of the potential for eroded materials to be delivered to the stream system. The following table summarizes the number of watersheds with high or extreme risk factors in each mountain range.

Table 7. Sixth-level watersheds with high or extreme risk of effects to water quality from surface erosion.

Mountain Range	**Total 6th-level watersheds in mountain range**	**# with high or extreme soil erosion risk / % of 6th-level watersheds**	**# with high or extreme road-stream crossing densities / % of 6th-level watersheds**	**# with a high or extreme density of roads within 200 feet of stream courses / % of 6th-level watersheds**
Laramie Peak	39	20 / 51%	3 / 8%	2 / 5%
Pole Mountain	12	3 / 25%	1 / 8%	5 / 42%
Sierra Madre	47	1 / 2%	3 / 6%	5 / 11%
Snowy Range	60	8 / 13%	14 / 23%	14 / 23%

The intense precipitation events in the Laramie Peak unit make these roads highly susceptible to surface erosion during runoff events (see AQ 1).

The primary opportunities to reduce surface erosion identified in a subforest scale roads analysis include:

- Increasing the number and effectiveness of drainage structures.
- Improving the road surface by either gravelling, or adding a binding material to those roads that have native surfaces with no inherent binder.

AQ3: How and where does the road system affect mass wasting?

Road-related mass wasting results from 1) improper placement and construction of road fills and stream crossings, 2) inadequate culvert sizes to accommodate the peak flows, sediment loads, and woody debris, 3) roads located on soils prone to mass wasting, and 4) water diversion onto unstable hillslopes.

The sensitivity of an area to mass wasting depends on the interaction of the soils and underlying bedrock, slope steepness, and the subsurface hydrology. Mass wasting is not a widespread concern on the Medicine Bow National Forest, but it does occur in localized areas. Appendix B identifies watersheds with soils prone to high mass movement potential. We identified a few areas in the Snowy Range and Sierra Madre mountain ranges that are prone to mass wasting. Project-level analyses will consider the effects of maintenance level 1-2 roads on mass wasting and potential concern areas for new road construction.

More in-depth analysis from subforest scale analyses will identify areas where the interaction of the soils, underlying bedrock, slope steepness, and subsurface hydrology are creating high priority concern areas. This analysis will also help us identify watersheds where additional road construction may cause mass wasting. Opportunities to address existing roads in areas with high mass wasting potential include:

- Road relocation to an area with more stable soils.
- Relocation of drainage structures so that the outlets are on less sensitive areas which may include flatter slopes and better-drained soils.

AQ4: How and where do road-stream crossings influence local stream channels and water quality?

Road-stream crossings have the potential to directly and indirectly affect local stream channels and water quality. Poorly designed crossings directly affect hydrologic function when they constrict the channel, when they are misaligned relative to the natural stream channel, or when improperly sized culverts are installed. Road-stream crossings also act as connected disturbed areas where water and sediment are delivered directly to the stream channel. Connected disturbed areas are defined as "high runoff areas like roads … that discharge surface runoff into a stream or lake … connected disturbed areas are the main source of damage in all regions" (FSH 2509.25-99-2).

Increasing peak flows through the extended channel network (see AQ1) increases the energy available for in-channel erosion, which affects stream stability and increases sedimentation. The biggest water quality concern associated with the road system is sediment delivered to the stream system through connected disturbed areas.

The density of road-stream crossings in each 6^{th}-level watershed was used to determine those watersheds where the road-stream crossings posed the highest risk to local stream channels and water quality. Watersheds were determined to have a high, medium, or low priority for further evaluation through a subforest scale roads analysis (see Appendix A).

Opportunities to improve concern areas identified through subforest scale analysis include:

- Designing crossings to pass all potential products including sediment and woody debris, not just water.
- Realign crossings that are not consistent with the channel pattern.
- Change the type of crossing to better fit the situation; for example, consider bridges or hardened crossings on streams with floodplains, and consider bottomless arch culverts in place of round pipe culverts
- Add cross-drains near road-stream crossings to reduce the connected disturbed area
- Reduce the number of road-stream crossings to minimize the potential for adverse effects

AQ5: How and where does the road system create potential for pollutants, such as chemical spills, oils, deicing salts, or herbicides, to enter surface waters?

Anywhere roads run adjacent to or cross streams or floodplains, there is some potential for spilled pollutants to access streams. Poorly cross-drained ditches may transport spilled pollutants to standing or flowing water bodies. Generally, these pollutants are not transported in bulk across the Medicine Bow National Forest except where noted below. County weed programs do use herbicides on the Forest and will create some potential for pollutant contribution in the case of vehicle or equipment accidents. Log haulers and other heavy equipment associated with harvest and road activities carry sufficient fuel and oil to cause localized water quality problems should an accident occur. This is minimized by stipulations in timber sale contracts that specify haul speeds, fueling practices, weather or road moisture limitations, and other aspects of the operations. Forest road maintenance crews are also trained to utilize safe areas and procedures for refueling heavy equipment. The potential for pollutant associated with log haulers would be highest on those roads commonly used for timber harvest access, particularly maintenance levels 3-5 roads.

The application of magnesium or calcium chloride for road dust abatement may affect water quality, but past studies have found that the effects can only be detected after many years of repeated year-round application (Heffner 1997). Typically, magnesium or calcium chloride is only applied 1-2 times per year on roads requiring it, generally, maintenance level 4 and higher roads. This factor should be considered when upgrading the maintenance level to 4 or higher. This may be a concern in areas where aquatic threatened, endangered, and sensitive species are present.

Magnesium and calcium chloride may be used during the winter months as de-icing agents, although this is not a common practice on highways that run through the Medicine Bow National Forest. If and or when deicing salts are used, the application rates are often higher than for dust abatement, the chemicals do not bind with the soils (or pavement in the case of de-icing), and the frequency of applications is generally higher. For these reasons the use of these salts for de-icing purposes has a higher potential for affecting water quality. One study found that wells contaminated with chloride were on average 24 feet away from the treated highway. In a worst-case scenario, a stream with a flow of 20 cubic feet per second resulted in a chloride concentration of 275 ppm in a 24-hour period. This concentration was slightly above the drinking water standard and below the tolerance limits for trout (Heffner 1997). A recent study on I-70 in near the Eisenhower Tunnel in Colorado found that the use of magnesium chloride for deicing is highly unlikely to cause adverse effects to water quality or aquatic organisms at distances greater than 20 yards from the highway (CDOT 1999). A similar study along I-70 on the west side of Vail pass found a substantial increase in chloride concentrations below the highway where deicing salts were used relative to control streams, but the concentrations were still within state water quality standards (Lorch 1998). While no specific information was gathered to compare the application rates and frequency of deicer on highways which run through the Medicine Bow Forest as compared to I-70, it is a reasonable assumption that both frequency and application rates are higher on I-70, and that the results from the I-70 study should be applicable to the Medicine Bow Forest. Highways in which deicing salts are used would have the highest risk of affecting water quality, but

these effects are generally localized, do not exceed water quality standards, and become diluted as the salts move downstream through the system.

Highway 230, as it descends down to Woods Landing, was identified as the highest risk road, particularly where it runs adjacent to Woods Creek. This would be true from the standpoint of deicing salts, and also hazardous materials that are transported by trucks. Goods that were transported by railway are now transported via trucks between North Park and Laramie over this highway. A specific concern is fluorite being transported out of North Park, although a wide variety of potentially hazardous materials are transported on this highway.

AQ6: How and where is the road system "hydrologically connected" to the stream system? How do the connections affect water quality and quantity?

The road system is hydrologically connected to the stream system where there are connected disturbed areas (see AQ 2 and AQ4). This includes road-stream crossings, as well as areas where roads are adjacent to stream courses and there is an insufficient buffer strip between the road or road drainage structures and the stream system. As discussed in AQ1, the extended channel network can increase peak flows. As discussed in AQ4, water quality can be degraded where connected disturbed areas increase sediment delivery to the stream system. Connected disturbed areas with highly erodible soils are the most likely to deliver sediment to the stream system.

All of the factors identified in AQ 1-4 were used to develop an overall watershed risk rating (see Appendix A). The overall risk rating represents the potential for hydrologically connected areas which can affect both water quality and water quantity. The Pole Mountain division had the highest percent of watersheds with high or extreme total risk ratings, while the Snowy Range division had the overall highest number of watersheds with high or extreme ratings (see following table).

Table 8. Sixth-level watersheds by mountain range with overall high or extreme risk ratings.

Mountain Range	Total number of 6th level watersheds	Number of 6th level watersheds with overall high risk ratings	Number of 6th level watersheds with overall extreme risk ratings	Percent of watersheds with high or extreme risk ratings
Laramie Peak	39	2	1	8%
Pole Mountain	12	5	1	50%
Sierra Madre	47	9	1	21%
Snowy Range	60	19	7	43%

Watersheds with extreme and high risk ratings would be the priority for subforest scale analysis. Analysis at this smaller scale would identify site-specific problem areas and opportunities for reducing the effects of the road system on water quality and quantity.

Opportunities to address concern areas identified in subforest scale analyses are the same as in AQ1, AQ2, and AQ4. Additional opportunities include relocating roads adjacent to stream channels to a position higher on the hillslope away from streams.

AQ7: What downstream beneficial uses of water exist in the area? What changes in uses and demand are expected over time? How are they affected or put at risk by road-derived pollutants?

Downstream beneficial uses of water in the area are outlined in the objectives of the Wyoming pollution control program as outlined in W.S. 35-11-102. These objectives are specifically designed to maintain the best possible quality of waters commensurate with the following beneficial uses:

- Agriculture.
- Protection and propagation of fish and wildlife.
- Industry.
- Human consumption.
- Recreation.
- Scenic value.

The pollution control program is also designed to achieve the goal of the federal act, which is to achieve, wherever attainable, surface water quality which provides for the protection and propagation of fish, shellfish, wildlife, and recreation in and on the water.

There are four classes of surface water in Wyoming (see *Water Quality Rules and Regulations, Appendix A* for a specific listing).

Class 1 - Those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. In designating Class 1 waters, the Environmental Quality Council shall consider water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people.

Class 2 - Those surface waters, other than those classified as Class 1, which are determined to:

- Be presently supporting game fish; or
- Have the hydrologic and natural water quality potential to support game fish; or
- Include nursery areas or food sources for game fish.

Class 3 - Those surface waters, other than those classified as Class 1, which are determined to:

- Be presently supporting nongame fish only; or
- Have the hydrologic and natural water quality potential to support nongame fish only; or
- Include nursery areas or food sources for nongame fish only.

Class 4 - Those surface waters, other than those classified as Class 1, which are determined to not have the hydrologic or natural water quality potential to support fish and include all intermittent and ephemeral streams. Class 4 waters shall receive protection for agriculture uses and wildlife watering.

Except for waters in wilderness areas and a few exceptions, all waters within the boundaries of National Forests are designated as Class 2.

Accordingly, on-forest and downstream beneficial uses of water vary by waterbody classification. On-forest, waterbody classifications are generally limited to Class 1 and Class 2 designations. Once streams leave the Forest, classifications and designated uses may change.

Changes in classification and designated uses sometimes occur over time as knowledge of certain water bodies increases or as stakeholders petition the Wyoming Department of Environmental Quality (WYDEQ). Classifications can be either upgraded or downgraded through this public process with commensurate changes in protected designated uses.

Demands for most water uses are following an increasing trend. With increases in population, public and private lands recreation, agriculture, and industry, controversy over appropriate uses of water will also grow. Most major river basins in the West are fully or over-appropriated, adding complexity to the problem of determining the best use of state waters.

Several of the designated uses for on-forest waterbody classes can be affected by road-derived pollution. Either Class 1 or 2 water bodies can include cold and warm water game fish and non-game fish support as designated uses. These are detrimentally affected if sediment from forest roads surpasses the tolerance of the fish and prey (aquatic invertebrate) populations or if roads cause channel instability which degrades aquatic habitat (see AQ 1-4, AQ 6). The Class 1 Non-Degradation standard can be violated if water quality is lowered through lack of best management practices during road design, building, or maintenance; it can also be violated if these conservation practices are implemented but not effective.

The West Fork of Battle Creek and Haggerty Creek, both in the Sierra Madre Division, are listed as impaired on the Wyoming 303(d) list (WYDEQ 2000) for impairment of coldwater fisheries. Haggerty Creek contains elevated silver, copper, and cadmium concentrations associated with an inactive copper mine in the headwaters. The West Fork of Battle Creek contains elevated copper concentrations. While roads are not directly affecting the elevated metal concentrations, increased sediment loads from roads could further degrade coldwater fish habitat (see AQ12).

Other downstream beneficial uses include domestic drinking water. Question WP 2 addresses the effect of roads on municipal watersheds. In addition to the designated municipal watershed, Hog Park Reservoir and Hog Park Creek on the Sierra Madre Division hold and transport water which is used as a public water supply after being diverted from the Little Snake River headwaters. Roads are not believed to be significantly affecting water quality for public water supply.

AQ8: How and where does the road system affect wetlands?

Roads can affect wetlands directly by encroachment, and indirectly by altering hydrologic surface and subsurface flow paths. Encroachment results in a loss of wetland area directly proportional to the area disturbed by the road. Alteration of the hydrologic flow paths can affect wetland function with the effects extending beyond the area directly affected by the road. The Watershed Conservation Practices Handbook (FSH 2509.25) provides measures to protect wetlands

During project-level analyses, opportunities to reduce the effects of the road system on wetlands include the following:

- Relocate roads out of wetland areas.
- Where relocation is not an option, use measures to restore the hydrology of the wetland. Examples include raised prisms with diffuse drainage such as french drains.
- Set road-stream crossing bottoms at natural levels of wet meadow surfaces.

AQ9: How does the road system alter physical channel dynamics, including isolation of floodplains, constraints on channel migration, and the movement of large wood, fine organic matter, and sediment?

Roads can directly affect physical channel dynamics when they encroach on floodplains or restrict channel migration. Floodplains help dissipate excess energy during high flows and recharge soil moisture and groundwater. Floodplain function is compromised when roads encroach on or isolate floodplains. This can increase peak flows. When peak flows increase, more water is available for in-channel erosion, which, in turn, affects channel stability. Restricting channel migration can cause channel straightening which increases the stream energy available for channel erosion. This can also result in channel instability. Altering channel pattern affects a stream's ability to transport materials, including wood and sediment.

We used the miles of road within 200 feet of a stream/river as an initial indicator of where the road system might be affecting physical channel dynamics. These concerns are greatest on reaches with floodplains where the streams naturally meander, typically lower gradient reaches. Table 8 identifies the number of watersheds with high or extreme ratings for each mountain range.

AQ10: How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what degree?

Migration and movement of aquatic organisms are primarily restricted at road-stream crossings with culverts. Generally, the restriction is on upstream migration, although downstream migration can also be affected. This results from hanging culverts, high flow velocities in culverts, and inadequate depths for fish migration. In some locations, migration barriers are desirable to protect native species. While culverts can affect the migration of amphibian species, the greatest concern is the effect on fish species.

Brook trout are the most widely distributed fish species on the Medicine Bow National Forest. Other non-native species include rainbow and brown trout. The primary native species of concern is the Colorado River native cutthroat trout (CRN). There are no known migration barriers on any of the maintenance level 3-5 roads on the Medicine Bow National Forest (Greg Eaglin, personal communication) except for those designed to protect the CRN. If unknown migration barriers are present, they would most likely affect brook trout since road-stream crossings in streams containing CRN have already been evaluated.

We evaluated the potential for migration barriers associated with maintenance level 1-2 roads by identifying those watersheds that contain cutthroat trout and have high road-stream crossing densities (Table 6). These watersheds would be considered high priority for site-specific analysis at the watershed and project scales. Opportunities to address problem crossings include:

- Reset the culvert to eliminate the limiting factor.
- Replace the culvert with an alternative crossing such as bridge, hardened low-water ford, or bottomless arch culvert.

AQ11: How does the road system affect shading, litterfall, and riparian plant communities?

The road system directly affects riparian communities where it impinges on riparian areas. Roads can indirectly affect riparian communities by intercepting surface and subsurface flows and routing these flows so that riparian areas dry up and the riparian vegetation is replaced with upland vegetation. Riparian communities play a vital role in providing shade. Removal or degradation of these communities can affect stream stability and water temperatures, which in turn, affects aquatic habitat. The Watershed Conservation Practices Handbook (FSH 2509.25) provides measures to protect riparian areas.

Anecdotal information indicates that culverts can provide local hiding cover for trout, particularly at low flows. Culverts are generally not considered a significant source of hiding cover unless the riparian communities, which typically provide shading and hiding cover, have been significantly degraded.

Opportunities to address concern areas found in watershed or project level analyses include:

- Relocate roads out of riparian areas.
- Restore the hydrology in riparian areas that have been dewatered by the road system.

AQ12: How and where does the road system contribute to fishing, poaching, or direct habitat loss for at-risk aquatic species?

High traffic roads adjacent to streams with fish are the most likely to contribute to fishing and poaching. This is not generally considered an issue on the Medicine Bow National Forest and does not significantly affect aquatic populations and at-risk aquatic species.

The road system contributes to direct habitat loss where mass movements associated with roads directly impact stream channels (AQ3), where sediment is delivered directly to the stream channel through connected disturbed areas (AQ6), at road-stream crossings (see AQ4), and where the road system is restricting channel migration and isolating floodplains (see AQ9). Areas of particular concern are watersheds with Colorado River cutthroat trout populations that were identified as high-risk potential in AQ3, AQ4, AQ6, and AQ9. Opportunities to address problem areas would be similar to those previously identified.

AQ13: How and where does the road system facilitate the introduction of non-native aquatic species?

The introduction of non-native species occurs primarily through stocking of non-native fish. The Wyoming Game and Fish Department coordinates stocking locations with the Forest Service to ensure that non-native aquatic species are not being introduced into waters containing native fish species or waters that provide high quality habitat for native species reintroduction. Known stocking locations include La Bonte Creek (watershed 101800080301), Horseshoe Creek (watershed 101800080803), and Battle Creek near the Battle Creek campground (watershed 140500030402). These streams do not contain CRN.

AQ14: To what extent does the road system overlap with areas of exceptionally high aquatic diversity or productivity or areas containing rare or unique aquatic species or species of interest?

The road system generally has moderate overlap with areas of exceptionally high aquatic diversity or aquatic species of interest. The primary species of interest include Colorado River cutthroat trout, boreal toads, tiger salamander, and wood frog. Watersheds containing cutthroat trout and sensitive amphibian species were identified (see Appendix A). Those that have a high risk of resource damage associated with roads and containing sensitive aquatic populations would be a priority for more detailed watershed- or project-level analyses. This analysis identified one watershed in the Sierra Madre range and seven watersheds in the Snowy Range where species of interest were present in watersheds with high or extreme overall risk ratings.

This analysis also identified specific level 3-5 roads, which were in close to streams with sensitive species populations and may be affecting these populations (see Appendix C – Road Matrix Table).

Terrestrial Wildlife (TW)

TW1: What are the direct and indirect effects of the road system on terrestrial species habitat?

Pole Mountain

A prominent transportation feature, Interstate 80 (I-80) has been the subject of several wildlife/transportation system studies by the Rocky Mountain Forest and Range Experiment Station, Work Unit, Laramie, Wyoming (Ward 1978). The acreage removed from big game and small mammal habitat during I-80 construction and subsequent modifications has not been disruptive to populations. On Pole Mountain, I-80 does not have fences that prevent big game movement as it does in the Arlington winter range areas, fifty miles up the interstate to the northwest. Wintering big game do not congregate and move across this section of the interstate. Although there are road-kill mortalities, the big game have adapted to the high-volume traffic. Studies observed summer traffic volumes of 8,700 per day, and 400 cars and 53 tractor-trailers per hour (at 7 p.m.). This traffic volume produced sound levels as high as 62 decibels for cars and 69 decibels for trucks, yet elk were observed feeding within 400 yards (Ward, 1971).

Ward concluded that elk, cattle, and mule deer showed no aversion to the traffic noise associated with I-80. Ward's studies also concluded that displacement was the indirect effect of the arterial, collector forest road system to terrestrial wildlife habitat in the Pole Mountain. Elk spent the summers within 450 yards of very heavy recreation use such as motoring on the maintenance levels 3, 4, and 5 roads. On the other hand, people camping, picnicking, fishing, or hiking (in the majority of instances) displaced telemetered big game a distance of one-half mile. The indirect effect of the road system appears to be one of movement and displacement, which is acceptable. Elk populations in the area are at or above Wyoming Game and Fish Department herd objectives. Mule deer populations are down at present due to unknown factors. The mountain lion population is increasing, and individuals freely cross all features of the road network.

About twenty-five years ago on the Pole Mountain Unit, there was a significant effort to physically close unclassified roads to motorized vehicles. This has helped improve the effects of displacement and movement of terrestrial wildlife species reacting to the relatively high density of summer recreationists. The remaining road network is well located, and the density does not appear to be exerting noticeable negative effects on terrestrial wildlife habitat.

The threatened Preble's meadow jumping mouse has been documented in secure numbers on the Pole Mountain Unit (Bakeman 1997). This small mammal is associated with riparian areas, many of which are adjacent to maintenance level 3 or 4 roads. No new road construction has occurred in the Unit for many years. The 1986 Happy Jack Road (State Highway 210) upgrade, which involved realignments, relocations, was the last measurable direct impact to terrestrial species habitat. The Preble's meadow jumping mouse apparently was not affected by any loss of habitat in the few riparian crossings that took place in 1986.

The Pole Mountain Unit has a system of maintenance level 2, 3, and 4 roads that, for the most part, traverse the area via ridgelines above the cottonwood/aspen draws. Some level 2 roads go into the draws and are open for four-wheel drive opportunities. These roads are in decomposed granite natural surfaces and do not appear to be causing direct or indirect negative impacts to terrestrial species habitat.

Laramie Peak

Bighorn sheep, elk, mule deer, pronghorn antelope, and black bear are present in hunted population levels on this unit. Small mammals and gallinaceous[3] birds are also hunted. There is a full complement of species richness in the terrestrial wildlife habitat on this Unit. The predominant habitat type is ponderosa pine. Higher elevations support approximately 5,000 acres of lodgepole pine, and there are some areas of spruce-fir at the highest elevations. During the mid to late 1980s, a widespread outbreak of mountain pine beetle killed large acreages, both NFS and private, of ponderosa pine. Opportunistic wildlife species (e.g., woodpeckers, flickers) capitalized and did well following this period. Many private landowners sold the beetle-killed timber, and small timber operators constructed temporary roads into private holdings to harvest the trees. NFS lands are characterized as being in the higher, rougher portions of the unit, and road locations are difficult. Very little of this beetle-killed timber was harvested on NFS lands and there were no roads constructed to access and remove the trees that were harvested.

The road system had direct effects on terrestrial wildlife habitat many years ago. When county roads and Forest Service arterial and collector roads were located and then upgraded in the 1950s and 1960s, moderate acreages of terrestrial habitat were changed to road surfaces and cleared rights-of-way. These acreages were minimal in comparison to the total habitat across the landscape. All terrestrial species appear to still be present in viable population numbers. The indirect effects are displacement and movement of animals in reaction to humans who are using the road system. The NFS lands are rougher and less accessible. Minor displacement of animals is generally taking place in the lower-elevation drainages, along county roads, and on private lands.

The bighorn sheep population is a reintroduced/transplanted herd. Wild sheep have many pathogenic problems and were also easily killed out by early settlers. The road system does not appear to have a negative affect on the herd and sub-herds of wild sheep in the Laramie Peak Unit. Private landowners have closures that protect some of the sub-herds. Movement to and from lambing grounds is not distinctly known, but there does not appear to be any affect exerted by the road system on the sheep's travel pattern. The surmised problem for bighorn sheep habitat is successional change. Years of fires suppression have caused more closed canopy timber stands. Centuries ago, before fire suppression, the habitat was more open because of the frequent fires.

The threatened Preble's meadow jumping mouse is present in the unit. Road locations near riparian habitats for this animal are evidently not causing any problems.

The prominent Forest roads (e.g., Harris Park Road, Basin Road, Bear Creek Road, La Bonte) are well-established fixtures that big game species have adapted to and cross at will. Incidence of road-kills to terrestrial wildlife species is low on this system and well within normal limits. Indirect effects (temporary displacement) are not causing noticeable impacts to the terrestrial wildlife populations.

Many old unclassified roads on NFS lands have been closed, de-facto, by private lands making closures to the public. These would have been Forest access roads had they not been rendered inaccessible to the public.

The Laramie Peak unit road system of maintenance level 3 and 4 roads does not appear to be exerting noticeable direct or indirect negative effects on terrestrial species habitat.

[3] Gallinaceous birds are heavy-bodied, chicken-like (e.g., grouse, pheasant, turkeys).

Snowy Range (Medicine Bow Range)

The Wyoming Game and Fish Department supported the construction of Fallen Pines (329) Road. The Department wanted better access to the northeast area of the division to improve harvest of big game animals, principally the rapidly growing elk herd. Early settlers and market hunters decimated elk and deer herds. Elk were extirpated from the area by the turn of the century. They were reintroduced in the 1920s from Yellowstone Park stock and the population increased rapidly under protection. During the 1920s, the Sheep Mountain portion of this division was added to the NFS system as a Federal Wildlife Refuge for the recovery of elk. It is still a federal refuge today. Despite its status as a federal refuge, Sheep Mountain has always been managed under NFS regulations. Roads were constructed in the refuge and were used for access for about thirty years. Since the 1970s, all roads on Sheep Mountain have been closed to motorized vehicles. A trail system now provides very limited access.

Many of the arterial and collector roads in the division are located on original wagon roads that serviced the tie-hack camps from the late 1800s into the 1930s. Roads were upgraded as conventional logging techniques (trucking) replaced floating the logs down streams and rivers. These roads and their locations have directly occupied and subtracted a limited amount of acreage from terrestrial wildlife habitat. All species that were known to be present prior to the formation of the national forest are believed to still be present on the Forest, with the exception of the large carnivores, grizzly bear, gray wolf, and Canada lynx. These species still have habitat on the Snowy Range Division, but they have not been reintroduced. Such reintroductions are a socio/political consideration for the State Game and Fish Commission.

The Canada lynx (a threatened species) has been reintroduced in the state of Colorado (1999); as yet, there has been no known migration into this division. The policy of the U. S. Fish and Wildlife Service is to consider suitable Canada lynx habitat as "potentially occupied." Lynx habitat designation has been coordinated with the U.S. Fish and Wildlife Service, and lynx analysis units have been identified in the division. These units provide for the breeding, feeding, resting, movement of the animal. These designated units consider the direct and indirect impacts of the road system (Ruggerio et al 1999).

A designated scenic state highway, Highway 130, bisects the division. This highway does not have right-of-way fencing to preclude domestic livestock (permitted livestock). It does not impede movement of big game or small mammals; coyotes, bobcats, lions, bears routinely cross. There is a small incidence of road kill. For the majority of the year the highway is closed to wheeled motorized vehicles due to snowfall. It is closed usually in late October or early November and is reopened by Memorial Day, the last week of May. Big game movement in this division is from higher elevations to lower-elevation winter ranges.

State Highway 230 transverses the southeast corner of the division. This highway has right-of-way fencing. In 1990, the highway was widened, more area was cleared, and new fencing was installed. The new fencing was designed to accommodate big game crossing. The enlarged clearing has probably caused little direct loss of terrestrial species habitat. Lodgepole pine habitat in this flat area is expansive. The few acres converted to grasses and forbs probably increased diversity and may have benefited passerine[4] birds and small mammals foraging on grass seeds. Since this upgrade and re-fencing, road-kills have not noticeably increased. Big game young of the year seem to be crossing this fencing with very little loss. Displacement from this highway seems to be minimal. Mule deer commonly are seen foraging in the right-of-way. Moose have migrated into this area from reintroduction sites in Colorado. They are commonly seen near the highway and crossing the highway.

[4] Passerine birds are medium to small and well adapted to perching (e.g., sparrows, robins, wrens).

Wyoming State Highway 10 is to the southeast, taking traffic to the Laramie River area of Colorado. It does not cross the Forest. It parallels to the southeast and provides an entry node point to Boswell Creek Road (526) which proceeds westward to connect with State Highway 230. Highway 10 is not a factor to habitat other than being a network grid. Boswell Creek Road (526) usually snows in early and motorized vehicle use is restricted seasonally to protect lower elevation big game winter ranges.

Arterial and collector system forest roads in this division (e.g., Ehlin, Cinnabar Park, and Fox Creek Roads) and many other maintenance level 3 roads lead directly from the state highway grids to interior portions of the division. These roads are dissecting continuous forested habitat for terrestrial species. Direct and indirect impacts are low, and clearing limits are minimal for these roads. Many of the lower maintenance level roads are in the decomposed granite and on the plateau in the southern part of the division. The flat terrain on the plateau screens road sights and sounds. In contrast, roads located mid-slope in steeper surroundings exert more influence on wildlife; the sight and sound of traffic are more evident. This flat has experienced timber harvesting since the days of the tie drives.

For sixty years, a mill at Foxpark processed timber logged this area. Unclassified "work roads" were used to access many clearcuts in the area. Practically all of these roads have been physically closed to motorized vehicles; a few have become segments of system roads, mostly maintenance level 2 or 3. A few have become higher order components of the Forest road system. The indirect effects of past road building and the current remaining road system in this division have been the change in successional vegetation caused by timber harvest.

Terrestrial animals that prefer edge effect have benefited from these successional changes (Hoover and Wills, 1984). For example, the elk population in the division has exceeded Wyoming Game and Fish objectives (WGFD Report, 1998). During the 1950s, elk still were in the recovery mode. Harvests were low: 12 in 1950, 158 in 1955. Peak harvests occurred in 1975, 1976, and 1977, with 2273, 2324, and 2,164 killed, respectively. Clearcutting in the 1960s and 1970s increased successional vegetative changes, and a study explores this correlation with population growth and harvest results (Zmyj, unpublished 1990). Timber harvest associated with road construction probably has been the most noticeable affect to terrestrial species habitat in this division.

The 1985 Medicine Bow National Forest Land and Resource Management Plan has old growth requirements to maintain the diversity and richness of terrestrial wildlife species and habitat. As road construction and subsequent timbering have made successional changes, old growth reserves have been maintained across the division to provide habitat for wildlife species dependent on late seral vegetation. The 1985 Forest Plan identified management indicator species which were selected for their applicability and utility in assuring viable populations of later successional habitat species (Nordyke and Buskirk 1988). Similarly, older successional seres[5] and forest structures have been investigated for habitat use, e.g., woodpeckers (Loose 1993).

There are very few maintenance level 2 roads in this division. An example would be Cascade/North Twin Road (103), which is maintenance level 3 for a portion and then has a longer connecting segment of maintenance level 2. This road has high recreational value because it accesses many high-elevation lakes in the treeless tundra area. Elk, ptarmigan, and many other species use the habitat along this road. There is no discernible direct or indirect effect of this or other such roads.

Of the four divisions, the Snowy Range has more roads. The roads were developed to connect the tie-hacking camps and gold mining developments at Keystone, Morgan, and other small settlements. In later years, roads were built for Forest management activities and access to recreation sites.

[5] The whole series of communities which develop in a given situation is called the sere. The relative transitory communities are called seral stages or seral communities; the final or mature community is called the climax (Odum 1959).

Road density is relatively low due to the physical closure of low-level, single-purpose timber harvest roads to motorized vehicles. Since the implementation of the 1985 Forest Plan, Ranger Districts have been directed to analyze road densities within watersheds to monitor management impacts on elk habitat effectiveness. Ranger Districts were also directed to analyze forest plan compliance in Management Prescription 4B areas if elk was selected as a Management Indicator species for these areas. The 1985 Plan contains additional wildlife habitat provisions for road systems and road use. For the 4B Wildlife Emphasis Prescription areas, the plan states:

> "1. Manage road use to provide for habitat needs of management indicator species, including road closures and area closures, and to maintain habitat effectiveness."

The 1985 plan also establishes standards for open road density of not more than 1.2 miles per 640 acres (1 sq. mi.). The standards and guidelines have been monitored annually.

The Snowy Range Division with its system of maintenance level 3, 4, 5, and few 2 roads is apparently accommodating habitat needs of all resident wildlife. There are no indications that the road network is causing noticeable negative or positive, direct or indirect effects to terrestrial wildlife habitat.

Sierra Madre

Big game species in this division were heavily hunted and used for subsistence by early settlers. Elk were extirpated by the turn of the century. After reintroduction of the species, recovery occurred until the first season of fifty permits was declared in 1958. The elk herds have done very well, and the species is now at or above objective levels (WY Game and Fish Department 1998).

Mule deer were not extirpated but were severely decimated. The species has recovered very well after protective laws and enforcement occurred during the 1920s. The division is now a very productive and popular big game hunting area. The present day forest road system is heavily used for this activity during the fall months.

Bighorn sheep were extirpated. Diseases and pathogens such as lungworm and pneumonia decimated the herds. Bighorn sheep were reintroduced into the Encampment River area in the 1970s, and these initial efforts were quite successful (Haas 1979). After initial good reproductive success, the herd has declined due to disease (Cook 1989). The road construction for timber cutting units has had few direct effects but several positive indirect effects for the Encampment River bighorn sheep herd. Arnett (1990) found that timber management in the area could be used to expand suitable habitat for bighorn sheep. The indirect effects of road building for clearcutting are greater visibility for predator detection and increased forage production and availability, particularly grasses and forbs (Arnett 1990). Much of the wild sheep range is in the Encampment River Wilderness Area and is unroaded. The beneficial clearcuts are to the west of the wilderness area and were accessed via the collector road system, Forest Road 550 and 550.2C (Jones Creek). These are maintenance level 3 and 4 roads.

Forest carnivores have been studied in the area. The Rocky Mountain Station lab in Laramie has been researching the indirect effects of timbering on the American marten (Raphael 1994). The Rocky Mountain Station examined the effects of high-density clear-cutting with temporary road building (Coon Creek watershed) on marten and associated prey species. This experimental, high-density timbering project was designed to increase streamflow and did not appear to have significant affect on the marten.

The Canada lynx, a threatened species, has suitable habitat in the division. The U.S. Fish and Wildlife Service assumes the species may be present. There are no documented observations of the animal since it was trapped out many decades ago. The road system does not fragment the identified lynx analysis units in the division. The Battle Highway, Wyoming Highway 70, does not have a negative effect on this species. Indeed, this highway is not plowed and open during the winter months, when this animal is moving about in search of its primary prey species, snowshoe hare. The arterial, collector forest road network is also snowed in during the critical winter period for this large carnivore. All lynx analysis units are evaluated on a project basis, to meet the standards of the national Canada Lynx Conservation Assessment and Strategy (Ruediger et al 2000).

Maintenance level 2, 3, and 4 roads apparently have little affect on bird species. For example, the low maintenance roads in the Cottonwood Park area have not caused direct or indirect impacts to the Columbian sharp-tailed grouse leks in the area. This species is of interest because a petition for listing (as a threatened species) was submitted and rejected. The U.S. Fish and Wildlife Service determined that the species was "not warranted for listing." The leks have experienced an indirect beneficial effect from the road system. The road system has provided access for prescribed burning which has improved lek habitat.

The Sierra Madre Division with its system of existing maintenance level 3, 4, 5, and fairly numerous level 2 roads is apparently accommodating habitat needs of all resident wildlife. There are no indications that this network is causing noticeable negative or substantial positive, direct or indirect effects to terrestrial wildlife habitat.

Summary

In all four divisions of the Medicine Bow National Forest, the existing maintenance level 3, 4, and 5 roads, in concert with any associated paved Interstate or state highways, are not exerting any substantial negative or positive direct or indirect effects on terrestrial wildlife habitat.

TW2: How does the road system facilitate human activities that affect habitat?

Pole Mountain

Outdoor recreation is the predominant human activity in the Pole Mountain Division. Driving for pleasure to enjoy the Forest is likely the highest use in the recreation category. Snowpack closes the road system to motorized vehicles during the winter months, but it opens earlier than the other divisions. The city of Cheyenne, twenty miles to the east, and Laramie, fifteen miles to the west, are merely minutes away. Large group (reservation) campgrounds are located at certain points in the network. Other destination campgrounds and trailheads serve day picnickers, rock climbers, wildflower enthusiasts, and equestrians. These recreational activities are evidently exerting little affect on wildlife habitat. Human recreational activities, both in and out of vehicles, are causing minor temporary displacement of wildlife (Ward 1973).

Firewood cutting is not allowed in this area. The Forest Supervisor issued the closure order because of the ease of access and nearness of population centers and to maintain tree snag densities for cavity nesting birds.

The 1985 Forest Plan exempted this division (along with the Thunder Basin National Grassland Division) from meeting the road density guidelines for elk habitat effectiveness. These divisions, with their open character and greater number of lower-level roads, were thought to be special cases. The elk herd in this area was reintroduced quite late (1960s) and has had very limited authorized hunting. The road density guidelines also were deemed inapplicable due to the high average daily traffic (ADT) or seasonal daily traffic (SADT) counts that occur on the major arterial roads. The elk populating this area are accustomed to vehicle traffic and roads. The elk herd is thriving. The limited permits (about 150) per year are highly sought-after, and the area is noted for producing large bull elk.

Wildlife security areas for deer, elk, mountain lion are found on the more rugged slopes of the Sherman Mountains and Devil's Playground geologic area in the center of the unit. These are unroaded portions. All-weather roads to trailheads provide access to these areas. Even the most established and well-used trailheads, (e.g., the two Headquarters trailheads) do not seem to be substantially displacing wildlife from habitat.

Laramie Peak

The Laramie Peak division road system provides access to private inholdings. There are many small acreages, former homesteads, and medium-sized ranches intermingled with National Forest ownership. These inholdings do not seem to affect habitat use; the mammals and birds appear to have habituated to these points of human occupancy. For example, wild turkeys have done well in proximity to the road system and houses.

A widespread outbreak of mountain pine beetle during the mid to late 1980s affected vegetative succession in the region. The existing road system provided access to harvest the salvageable timber volume; few additional roads were constructed. Private landowners constructed a few timber harvest roads on private lands. Fuelwood gatherers used existing roads to take some of this volume. This human activity did not noticeably affect habitat. The tremendous number of standing snags (for woodpeckers) was not impacted by this occasional activity.

The area is fairly distant from any population centers. Douglas and Wheatland, Wyoming are not population centers exerting measurable impacts. Driving for pleasure and hunting are activities made possible by the road system. These activities do not appear to be affecting habitat.

Snowy Range (Medicine Bow Range)

The Snowy Range is the most roaded of the four divisions and has been the most intensively managed for timber production. This human activity is the one most likely to affect wildlife habitat. Construction of temporary roads has an immediate impact, which is reduced after the actual construction phase. Pederson (1978) found that, during road construction, big game didn't use areas adjacent to the disturbed area for a distance of 1,500 meters. Beyond that distance, there was no significant difference between pre- and post-disturbance big game use. Ward (1976) used radiotelemetry, time-lapse photograph, and counts of elk tracks on roads to gather data on elk behavior in relation to timber harvest and traffic on the Snowy Range for a four-year period. This research found that elk preferred to be a least 800 m (1/2 mile) from people engaged in clearcut timber harvest or cleanup operations. Elk moved back to the harvested areas soon after human activity stopped. Traffic on Forest Service roads (logging, recreation, etc.) had little effect on elk activity, especially beyond 400m (1/4 mile) from the road. Heaviest elk crossings occurred where desirable feeding sites (clearcuts, natural openings) were near the road. Slow vehicle speed and low traffic during elk activity periods, usually under low light conditions or at night, limited accidents and elk disturbance (Ward 1976).

Studies have also documented the effects of human activities that occur out of vehicles. Ward (1973) found that elk preferred to be at least 1/2 mile from people engaged in out-of-vehicle activities such as camping, picnicking, or fishing. This study also documented a 1972 summer count of 6,901 vehicles over the Platte River access road (Rd.#512, maintenance level 4) while observing elk within 100 yards of moving vehicle traffic, particularly in open parks where feeding elk by were shielded from the roads by conifers (Ward 1973). A specific study in 1980 documented firewood cutting/gathering in the Rock Creek Park area of the Snowy Range. This study found that concentrated fuelwood gathering by relative high numbers of users can displace elk a distance of one mile. Telemetered mule deer were more tolerant of the disturbance and continued to use the area although they preferred to stay in the trees (Ward 1980).

The road system makes wildlife habitat management activities (e.g., prescribed burns, aspen regeneration, seeding of clearcuts to enhance grasses and forage species) easier and more efficient. Most of these activities are funded through Sale Area Improvement (SAI) plans. Temporary work roads are used to access areas where improvements will be made. When the roads are no longer needed, they are physically closed to motorized vehicles.

Sierra Madre

The Sierra Madre Division has a road system that allows a good representation of multiple use activities that affect habitat. Grazing, timbering, mining, recreation are activities potentially affecting habitat or use of habitat (habitat effectiveness). Early uses of the division land, such as mining and grazing, have declined. A rudimentary transportation network provided access for these activities. More modern day uses, such as timber harvest by mechanized means and summer recreation access by low-clearance vehicles, has increased the number of all- weather, higher-maintenance level 4 and 5) roads. The Battle Highway was paved during the mid-1990s. The small towns of Saratoga and Encampment, Wyoming have benefited from the improved access for hunting, fishing, fuelwood gathering, camping, and other outdoor recreation pursuits. Driving for pleasure is another very popular recreation activity.

These activities have not apparently had a noticeable or measurable affect on terrestrial wildlife habitat since the rapid expansion of the road grid in the 1970s. Ward (1985) found a comprehensive study of elk use in the area (Jack Creek, Green Ridge, Battle Creek, and Blackhall Mountain) that showed four areas where elk and high human activity levels were both present. Over 90% of the elk locations (18 telemetered elk) were within a mile of human activity (people recreating or working) where roads density was over one mile per section.

The Huston Park Wilderness Area and Encampment River Wilderness Area have few trailhead access points. Use of these wilderness areas is comparatively low. The Huston Park Wilderness is along the Continental Divide Trail system and does receive some volume of use associated with that national trail. In these two wilderness areas, motorized vehicles delivering wilderness visitors to the few trailheads have not apparently had negative effects on habitat for summering big game species, fur-bearers, forest hawks, and passerine birds

Summary

In all four of the divisions of the Medicine Bow National Forest, the existing road system (in maintenance levels 5, 4, 3) is facilitating human activities that affect habitat. The activities range from human-influenced successional change (from timber harvests) to minor temporary displacement from habitat. These activities are not substantially modifying habitat or habitat use patterns.

TW3: How does the road system affect legal and illegal human activities? What are the effects on wildlife species?

Pole Mountain

The Pole Mountain Division road system supports a high volume of legal human outdoor recreational activities, which have a moderate affect on wildlife populations. People from Cheyenne and Laramie, Wyoming use the area on a regular basis.

For example, the road system allowed rifle shooters to disperse themselves throughout the area, put up targets, and shoot many rounds of ammunition. Though the effect was minor, this activity was temporarily displacing big game animals. Due to growing dispersed recreational use of all types, higher densities of human use, and a concern for human safety, firearms discharge is now prohibited on the division between March 31 and September 10 each year. This should have a minor positive effect on big game animals.

Hunting is still permitted on the unit, and hunters annually legally harvest pronghorn antelope, mule deer, white-tailed deer, and elk. The most sought-after (limited) license is for elk.

Special uses for large groups (e.g., equestrian endurance races) are popular legal activities. At locations like Headquarters Spring, weekend camps are erected. These camps concentrated numbers of people and horses and temporarily displace big game and other mammals. Suitable displacement areas are available. The north side of the Sherman Mountains, Green Mountain, and the Twin Peaks area has rugged inaccessible areas to accommodate displaced animals.

Illegal human activities such as poaching are probably less common than one would expect, given the character of use in this unit. The area and road system does not lend itself to poaching because recreationists are interspersed in camps and are driving around the unit at practically all hours of the day. The public is very cooperative in reporting poachers. The area is fairly well patrolled by U.S. Forest Service and Wyoming Game and Fish Department personnel. A poacher runs a high risk of observation on this division.

Nearness to urban centers has brought a certain amount of illegal dumping—old appliances, carpets, etc. This has decreased in recent years, due to citizen cooperation, reporting, and prosecution. The affect on wildlife was negligible.

Laramie Peak

The Laramie Peak Division has a road system that is annually used for various legal hunting seasons. There are baiting stations for hunting black bear; the Wyoming Game and Fish Department regulates placement of these stations. Spring bear baiting was very popular until recent years when the Department drastically curtailed the bear harvest quota. Until approximately five years ago, the harvest was unrestricted. A female mortality quota of just a few bears is now in effect. Baiting near the road/trail system still occurs.

Mountain lions are hunted under a similar quota system, and the area is popular for that activity. The road system allows hunters to trailer horses and haul hounds to access the rugged terrain in this division.

The checkerboard federal, state, and private ownership pattern of this division creates greater potential for timber theft, unauthorized road/trail construction, and other illegal land use activities. The incidence of these activities is probably low given the existing potential. Poaching for subsistence has declined during recent decades. Better employment opportunities in energy jobs in Douglas and Wheatland, Wyoming have probably lessened this activity.

Snowy Range (Medicine Bow Range)

The Wyoming Game and Fish Department intensively manages the Snowy Range for big game hunting. The Department manages hunting by identifying six hunt units for elk and four hunt units for mule deer. Legal hunting season activities probably exert more concentrated use on the road system in a few weeks than any other activity. The lower maintenance level 2 and 3 roads are especially important to support this activity. The effect on big game animals is one of displacement, movement. Probably no other out-of vehicle activity has more impact than hunting. The objective of the activity is contact with the animal, consequently the measurable impacts are more prevalent than occasions of incidental contact by persons pursuing other activities (Ward 1976 and 1977).

Roads such as the Fallen Pines (329, maintenance level 3) were constructed in part to get better access to improve elk harvest. Access from the eastern side of the division was blocked by private holdings. Twelve miles of access, transporting elk hunters into the east and northeast portion of the Division was envisioned to alleviate this lack of harvest problem. Local, intermittent spur roads were constructed to access timber harvest units in the Fallen Pines area. These roads have subsequently been physically blocked with gates, and the harvested areas have signs designating them as restricted to motorized vehicle use for wildlife security areas. This management approach is popular with local hunters.

The road system makes it possible to conduct legal activities as well as illegal ones. The legal hunter or poacher uses the same system. The firewood cutter with a legal permit is using the same roads as the person who illegally cuts firewood without a permit. Fortunately, the small percentage of illegal activities that are occurring are not substantially impacting terrestrial wildlife populations.

Sierra Madre

The Sierra Madre Division is divided into four elk hunt areas and four mule deer hunt areas. The area is considered very good for legal mule deer hunting. The road system brings resident and non-resident hunters into the area from all quadrants. The interstate highway system (I-80) brings non-resident hunters into Rawlins and Saratoga, Wyoming, then via county roads into the Forest road network. This activity accounts for a high percentage of the annual traffic in the grid. Dispersed camping is very popular for the annual fall hunting season. There are a limited number of developed campgrounds to serve these legal hunters. In recent years, legally hunted animals have shown a tendency to leave NFS lands for private lands on the western side of the division after the season gets underway. The resident elk herd has always used certain security areas on NFS lands (Ward, 1985).

There is definite interchange and travel between the Wyoming managed elk herd and the Colorado managed elk herd to the south. A substantial area along the state line is roadless, and the animals move to security areas depending upon the opening/closing dates of the hunting seasons and hunt units in the two states. The Sierra Madre herd has grown rapidly since the first hunting season in 1958. Legal hunting is considered necessary to elk numbers within limits to keep them from over-using important low-elevation winter range. If the populations are not controlled, big game can also impact hay meadows and stored hay on private land. The road system is adequately accommodating this desired, legal activity.

Illegal activities in this division are the same as for the Snowy Range. The northwestern side of the division is fairly remote from any law enforcement patrols. Poaching for large, commercially desirable, mule deer trophies may be occurring in that area.

Summary

In all four divisions of the Medicine Bow National Forest, the existing road system (maintenance levels 5, 4, and 3) affects the public's legal and illegal activities. In many instances, the legal activities have a positive effect on wildlife populations and the illegal activities have a negative effect. The net effects to wildlife populations are negligible. The illegal activities are performed by a small percentage of the population.

TW4: How does the road system directly affect unique communities or special features in the area?

Pole Mountain

The Pole Mountain Division has one of the few known populations (in Wyoming) of the threatened Preble's meadow jumping mouse. This population was located during the late 1990s, prior to the listing of the species. Since listing, more surveys have located a substantial number of individuals, indicating a strongly viable population. Preble's meadow jumping mouse specimens are undergoing further study. The Pole Mountain area is higher elevation for this species. In this division, the ranges of the Preble's meadow jumping mouse and the western jumping mouse overlap. The two species are very closely related. Currently, DNA testing is used to differentiate between them, though other taxonomic procedures are being developed. The road system hasn't negatively affected this unique population. The mouse is found in riparian areas where grazing and recreation take place. No new roads crossing the mouse's riparian habitat are planned.

Laramie Peak

The Laramie Peak area has very good, rough habitat for bighorn sheep. This transplanted herd seems to be separating into sub-herds. The low-order (maintenance level 2 and 3) roads near movement corridors or lambing areas are apparently not affecting this unique community/population.

Snowy Range (Medicine Bow Range)

The Snowy Range presents a fairly unique opportunity for the motorized public to experience alpine tundra. At the crest of the Medicine Bow Range in the Libby Flats area, the state highway leads to several short spur roads (e.g., Brooklyn Lake 317, maintenance level 4) that bring the public to the high-altitude alpine tundra. Here they can experience wildlife such as the pika, marmot, and white-tailed ptarmigan. The road system has also allowed researchers to study high-altitude, glacial tarn lakes. Ordinarily such high-altitude lakes are in remote roadless/wilderness areas which preclude the installation of experimental equipment and apparatus. Forest Service scientists have taken advantage of this special feature to learn more about things like the acidification of high-altitude lakes.

This division has some bald eagle nests on the Platte River (inside the Platte River Wilderness). These unique wildlife features can be seen by people either rafting the river or traveling on horseback from the road system trailheads.

Sierra Madre

The Sierra Madre has a reputation as a place for nonresident falconers to capture unfledged young falcons in the nest (eyas). This situation is largely due to state wildlife laws. Wyoming is one of two states that will issue falconer's take licenses to nonresidents. The Sierra Madre has some excellent goshawk nesting stands in quality lodgepole pine habitat. These take licenses are limited to approximately ten eyas birds in southeast Wyoming per year. The issuance is controlled. Falconers must have credentials, and facilities are inspected. Subsequent ownership of the bird is followed. The Wyoming Game and Fish Department feels that the taking of these birds is a minor removal of surplus in the population. The unique community is accessed by the road system. Many of these nonresidents are from the Midwest or eastern states and have become familiar with the road network and better locations for taking birds.

Summary

The unique communities or special features in the four divisions of the Forest are directly affected by the road system, which provides easier access to members of the scientific community or wildlife enthusiasts. The road system and the easy access it provides don't appear to be degrading or diminishing wildlife habitat, wildlife populations, or special features in the divisions. There may be positive benefits to making access easier for the scientific and academic community.

Ecosystem Functions and Processes (EF)

EF1: What ecological attributes, particularly those unique to the region, would be affected by roading of currently unroaded areas?

There are three types of special management designations that would potentially be affected by roading: Research Natural Areas (RNAs), Special Interest Areas (SIAs), and roadless areas (proposed for Wilderness designation). These effects will be analyzed in the Environmental Impact Statement (EIS) for the revised Forest Plan.

Currently, there are six SIAs and one RNA on the Medicine Bow National Forest. Forest plan alternatives include 16 potential RNAs and 18 potential SIAs. The rationale for proposing SIAs is based on the opinion that these areas not only contain unique attributes but that best represent the various categories of SIAs on the Forest. Individual roadless areas (inventoried as of 2000) will be discussed in detail in Appendix C of the Forest Plan EIS.

EF2: To what degree do the presence, type, and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases, and parasites? What are the potential effects of such introductions to plant and animal species and ecosystem function in the area?

Roads may influence the spread of exotic organisms through the direct effects of vehicles transporting organisms or through the indirect effect of habitat alteration and creation of early seral, bare soil or patchy ground cover that favors weedy species. The undesirable species may be unpalatable to native wildlife, may crowd out native plant species, or may have other undesirable effects on native species and ecosystems.

Pole Mountain

Recreation is the predominant use in the Pole Mountain Division. The roads in this division are designed to accommodate ingress and egress from destination campgrounds or popular dispersed camping. The road system does not support timbering. Range permittees transport cattle to the allotments or, in some cases, trail drive up from home ranches.

Off-road travel in this area is controlled. The potential for recreational low-clearance sedans transporting noxious weeds is low. There is no timber harvesting; consequently there is no potential for low-boys or skidders to spread noxious weeds.

Common weeds are already present. Many, such as the wind-borne weeds (e.g., dandelions), are present in all sectors of the division, but there is no perceived serious problem. Some of the more problematic noxious weeds such as toadflax, (butter-and-egg plant) are present in locales, and efforts for control and treatment have been on-going for several years.

Exotic animal species have arrived on the Pole Mountain Division without the assistance or influence of the road system. White-tailed deer (an eastern, mid-western species) were not found in the area forty years ago. Now, they are common. An expansion of range, migration has occurred. Eastern blue jays began appearing about thirty years ago because farmers in Iowa and Nebraska planted trees where they didn't grow naturally (aforestation) and created a habitat bridge. Aforestation has transported many of the migrating species, not roads.

Wyoming is one of the western states with statutes against the operation of game farms and possession of big game exotics. Road transport of such species therefore is not a consideration.

Dendrological pathogens, insects, diseases exist on the division. For example, blister rust in the limber pine has been noticed with more frequency. There is no connection with its occurrence or spread and the existing road system.

Laramie Peak

The Laramie Peak area has experienced a large scale, pandemic infestation of mountain pine beetle. The beetle population was just beginning to occur when climatological conditions and stand age conditions caused the infestation to become widespread. The road system had nothing to do with the introduction or spread of the insects.

The checkerboard land ownership pattern necessitates close cooperation with the counties to control noxious weeds. Cooperative treatment has helped to control thistles. Periodic maintenance (blading, ditch pulling) along the roads often spreads the exotic plants over more miles of road.

Timbering is not a substantial use of the NFS lands in the division. Private and state lands harvest a minor volume. The volume is usually processed locally or transported to small mills within a moderate radius. Weed contamination and transport by logging vehicles on the road system is likely negligible, unless the vehicles are coming from sales with known extensive noxious weed populations (e.g., sales in northeastern Wyoming or Montana). When this is the case, the timber sale clauses are invoked, and the logging vehicles must be washed prior to entering any new sale area.

Like the Pole Mountain division, the Laramie Peak area is experiencing the same influx of eastern bird species and a few mammals.

Snowy Range (Medicine Bow Range)

The Snowy Range Division has the most road miles, complexity, and has higher seasonal average daily traffic counts. Timber has been harvested here for many decades. Timber sales now have clauses requiring "wash downs" of logging equipment when moving from one logging location to another. This is to control the introduction of noxious weeds. For many years, timber sale, Sale Area Improvement (SAI) plans, and Brush Disposal (BD) plans made provisions for seeding of log decking areas, landings, and concentration points to preclude bare mineral soil going to weed species. Most clearcuts naturally revegetate with desirable native species. In some instances, the Forest Service has broadcast-seeded desirable forage mixes to improve big game habitat. This also helps prevent the establishment of undesirable plant species.

In 1996, the Forest Service issued a closure order to require use of only certified, weed-free hay statewide (in Wyoming and Colorado). This was to preclude hunters using horses and other equestrians from bringing in hay containing noxious weed materials. The road system, of course, played a roll in the spread of noxious weeds to the dispersed hunting camps. The certified weed-free hay program is showing success. Hunting camp dissemination of noxious weeds was not perceived as a serious problem, but the decision was made to join in with county efforts in the certified weed-free hay program to make an interagency combined effort against noxious weeds.

There are known small concentrations of yellow and Dalmatian toadflax, leafy spurge, knapweeds, houndstongue, and musk and Scotch thistle in the division. Canada thistle is more widespread. Control efforts with the counties concentrates along the road and trail system.

The presence of the Snowy Range road system and the type and location of its maintenance level roads is not thought to be a significant factor in the spread of exotic plant species.

Exotic animal species are not a factor in the Snowy Range. White-tailed deer have made their appearance in the last fifteen years. Their migration followed riparian areas and river courses, not the road system.

Sierra Madre

Sierra Madre has fewer maintenance level 3, 4, and 5 roads than the Snowy Range Division. The western slope of the division has a few cover types not found on the eastern slopes, Gambel's oak, for example. The noxious weeds and exotics (plants) are much the same east or west of the Continental Divide.

The state of Colorado, on the southern edge of the division, has different laws for big game commercial ranching. There have been a few instances of big game exotic species escaping from commercial establishments and moving across the state line into the division. These have been rare occasions, and the existing road system likely did not facilitate or increase this movement. These few occurrences could not be termed a "spread of an exotic species." The exotic animals were killed by Wyoming Game and Fish officers.

Forest pathogens, diseases are also naturally present in this division. Pine beetles have been present in and taking a regular toll of the timber stands for decades. Regional entomologists have different hypothesis to explain why the insect populations have never expanded. The road system has not apparently exerted any influence in the introduction or expansion of the insects or diseases.

Summary

The presence, type, and location of the road systems in the divisions has not appreciably increased the introduction or spread of exotic plant and animal species.

All four divisions of the Medicine Bow National Forest have certain levels (from localized to widespread) of insects, diseases, parasites, or undesirable exotic (noxious weeds) plants. The levels of noxious weeds are of immediate and continued concern, and without on-going management and control, the populations may become unmanageable. The Forest has been controlling noxious weed for many years. An integrated weed management Environmental Assessment (EA) was completed in 1996; the Implementation Plan was completed in 1999.

The ecosystems of the divisions are persistent conifer climax or sub-climax forests. The lodgepole pine type is especially persistent through its fire and silvicultural propensity to regenerate. Given the persistence of the spruce/fir and lodgepole pine types, the potential effects of any exotic introductions into the area are low.

EF3: How does the road system affect ecological disturbance regimes in the area?

Understanding disturbance ecology is a key part of ecosystem management. To have an effective ecosystem management policy, resource managers and the public must understand the nature and ecological resiliency and stability and the role of natural disturbance on sustainability. Efforts to suppress disturbance agents have reduced biodiversity and compromised ecosystem health. The more we attempt to maintain an ecosystem in a static condition, the less likely we are to achieve what we intended. We must be willing to bear both the economic and biologic consequences of such management. It is not a question of whether disturbance will happen but when, where, and what kind. We must incorporate the following information on disturbance into forest plans and project plans: the types of disturbance that are likely within specific ecosystems, the criteria for predicting where particular disturbances, and the probability of occurrence. This information and the management objectives for those areas can help resource managers better determine appropriate alternatives (Averill, 1994).

The most common disturbance agents affecting the Medicine Bow ecosystems are disease, drought, fire, insects, and wind. It is not possible to discuss one disturbance agent without recognizing the association with other disturbance agents. For example, insect outbreaks frequently are associated with drought, and drought creates a greater potential for fire. Increase tree mortality will increase the amount of ignitable fuel and increase the chances of fire and its intensity when it occurs. Root disease can predispose trees to attack by insects and root disease and makes trees more prone to windthrow.

Fire is thought to be the most significant natural disturbance agent in high elevation forests of the Rocky Mountains. It has shaped the vegetation mosaic for thousands of years by causing stand-replacing disturbances on a variety of scales.

The fire regimes of the Medicine Bow National Forest and that of Yellowstone National Park are often compared and thought to be similar. A study by Despain and Romme (1991) in Yellowstone National Park reconstructed the fire history for an area that was about two-thirds the size of the Snowy Range. Although fire has apparently occurred in every decade, they found that large scale, stand-replacing fires have occurred during four main periods since 1690 AD, separated by intervals of 20, 110, and 118 years. These do not represent intervals between fires in a specific stand, but rather between major fire events some where in their study area. During each major fire period, a large percentage (7-26%) of the entire area burned, initiating extensive, relatively even-aged patches of forest. They concluded that such even-aged cohorts become increasingly susceptible to burning as succession proceeds.

Fire records for the Medicine Bow National Forest from 1945-1993 (summarized by von Ahlefeldt and Speas 1996) show only six fires larger than 300 acres burned in the Snowy Range and Sierra Madre during this 48 year time span, accounting for almost 70% of the total land area burned. The largest fire recorded was 1267 ac, which is much smaller than the large historical fires described by the Despain and Romme study. The vast majority (95%) of the fires that burned on the Forest between 1945 and 1993 were less than 10 acres. The total area burned during these 48 years on the Snowy Range and Sierra Madre was only about 1.6% of the National Forest land in these two areas.

The reason for the low extent of burning on the Medicine Bow National Forest in recent years when compared to the longer-range historical fires is probably effective fire suppression.

As road access is created on the Forest, some increase in the number of human-caused fires is expected. This does not seriously affect the wildfire situation on the Forest, since access is usually conducive to rapid initial attack and suppression and roads provide a good firebreak.

Summary: The idea that an unroaded ecosystem will remain in a static, constant condition simply because we do not build roads in the area is not correct. Ecosystems in which the major disturbance regimes (such as fire) have been significantly altered are unduly stressed and vulnerable to upset by the slightest change. It is essential to understand and incorporate disturbance process, whether natural or human induced, in resource management. The consequences of trying to suppress a natural disturbance agent (such as lighting-caused fires) must be considered and possibly counteracted by inducing human caused disturbance events. Roads do not directly affect ecological disturbance regimes, but they are necessary for management access when human-induced disturbance events are part of our active resource management.

EF4: To what degree does the presence, type, and location of roads contribute to the control of insects, diseases, and parasites?

In general, road access facilitates the control of forest insects, disease, and parasites. Whether the type of control is direct (such as burning or de-barking of infested materials) or indirect (altering stand conditions to reduce insect and disease impact), road access certainly facilitates these control efforts by allowing crews and equipment to easily access and treat sites.

One of the forest plan goals is to "Monitor effects of insect and disease and treat vegetation to reduce the risk of epidemic outbreaks" (page III-5, Medicine Bow Forest Plan EIS, 1985). The forest plan general direction includes, "Prevent or suppress epidemic insect and disease populations that threaten forest tree stands with an integrated pest management (IPM) approach consistent with resource management objectives", (page III-84, Medicine Bow Forest Plan EIS, 1985).

The idea of integrated pest management is to manage resources in a manner that limits or reduces the development or perpetuation of pest problems. Silvicultural treatment of affected or susceptible tree stands can prevent and suppress insects and disease occurrences. As trees grow old, they decrease in growth rate and vigor and become less resistant to insect or disease attack. Severe conditions such as drought and overstocking can reduce tree growth rate, which also reduces resistance to insects or disease. An important characteristic indication of a healthy forest is the diversity and distribution of tree stand ages and species composition. The greater the diversity and distribution of stand ages and species, the more resistant the entire Forest is to damage from any single insect or disease.

Forest pathogens and diseases are naturally present. The most damaging pathogen to lodgepole pine is dwarf mistletoe. Dwarf mistletoe is a parasitic plan that grows into the bark of host trees, feeding off the food and nutrients the tree produces. Damage by dwarf mistletoe includes reduced growth, lower timber quality reduced seed production, increased mortality, and increased susceptibility to insect attack, root diseases, and storm damage. According to the best available estimates, Johnson 1995, losses from dwarf mistletoe are greater than any other tree disease in Region 2. Dwarf mistletoe not only causes losses in timber values, but it also adversely affects recreation values by killing trees or increasing the hazard of injury in campgrounds and picnic areas. A Forest-wide survey conducted on the Routt National Forest indicated 52% of the lodgepole pine type was infested with dwarf mistletoe. Conditions on the Medicine Bow National Forest are similar. The road system has helped the Forest Service use silvicultural practices to control this parasite. The road system is not spreading the disease.

Increased mountain pine beetle activity appears to be on about a 20-year cycle in the southern Rocky Mountains. The USFS Forest Health Service Center conducted an aerial detection survey in Wyoming between July and September 2000. The results showed that tree mortality caused by the mountain pine beetle has increased by at least 54% each year in Wyoming since 1996. A similar survey in Colorado concluded that mountain pine beetle mortality has increased in Colorado by 200% each year since 1995. Therefore, we seem to be approaching another high level of mountain pine beetle activity. There is no conclusion yet on whether this cycle will lead to just some localized outbreaks or if it will become an epidemic. The Forest Plan reported, "more than 60 percent of the lodgepole pine stands are in the moderate and high risk categories" (Medicine Bow Forest Plan EIS, page III-90) for mountain pine beetle outbreaks. "Without management, the number of acres in these categories will continue to increase." The road system is not aiding the spread of mountain pine beetles.

Spruce beetles generally attack and kill mature and overmature Engelmann spruce trees. Spruce beetle outbreaks occur when beetles spread from green down material, such as windthrow, to standing trees. In 1985, the Forest Plan reported more than 75% of the spruce/fir timber type is in a mature and overmature condition (page III-91, Medicine Bow Forest Plan EIS, 1985). A July 2001 query of the resource database indicates more than 78% of the spruce/fir timber type is in a mature and overmature condition (tree size large or very large). The Routt Divide Blowdown and other blowdown areas on the Medicine Bow from the same storm have provided perfect conditions for a major spruce beetle epidemic in southern Wyoming and western Colorado. There is no doubt now that a spruce beetle epidemic will happen in this area during the next few years.

Large areas of the Forest were consumed by wildfire in the 1890s. The trees in these areas are now approaching a size and age that is increasingly susceptible to insects and disease, especially in the lodgepole pine timber type. A July 2001query of the resource database revealed 502,892 acres or 57% of the forested lands are currently in a mature or over mature condition (tree size large or very large). Without management, these stands will continue to grow older and denser and create an environment that is conducive to a potential major outbreak of insects or disease.

Summary:

Most bark beetle detection, prevention, and suppression activities require road access. Without road access, insect and disease management on the suitable timberland and on other tentatively suitable timberland where management may be needed to meet desired conditions is not feasible. Twenty percent or 81,633 acres of the Forest Plan suitable timberland is in inventoried roadless and thus does not have road access for active management (see information in question TM 2-3).

EF5: What are the adverse effects of noise caused by developing, using, and maintaining roads?

This is not an issue at the forest scale. It will be addressed if it is an issue at the subforest scale.

Economics (EC)

EC (1): How does the road system affect the agency's direct costs and revenues? What, if any, changes in the road system will increase net revenue to the agency by reducing cost, increasing revenue, or both?

At the forest scale, this question can be answered in broad terms as a detailed cost/benefit economic assessment is not feasible. The IDT for the Medicine Bow National Forest RAP addressed this question by developing the Road Value versus Risk matrix and used this tool to determine what roads fell into which Road Management Category. The IDT identified four road management categories for this forest scale roads analysis.

The R2 Guidance for this question determined that there are three basic categories of roads: those that will always be open for obvious reasons, roads that will have motorized vehicle restrictions due to serious resource damage or annual budgetary constraints, and roads that don't fall into either of the first two categories (the largest category).

When looking at all maintenance levels of roads, the R2 Guidance is appropriate. However, the Medicine Bow National Forest RAP only considered level 3, 4, and 5 roads. The IDT determined early in the process that an assumption that most of these roads would always be kept open for obvious reasons was appropriate. Most of these roads were developed over the years for a variety of access needs, and considerable capital investments were incurred to construct these roads. Most of these roads were analyzed in some form, which likely included use needs, construction design standards, environmental considerations, and economic assessment.

The IDT's challenge was to develop a process to sort out those level 3, 4, and 5 roads that might not be meeting current and future access and land management needs, at least not at their current maintenance levels. This process helps identify opportunities to reduce road maintenance costs on some roads. The IDT also determined that even if funding was shifted from low value roads to higher value roads, the annual road maintenance funding for this forest was still significantly less than needed for the entire combined forest.

The IDT also assessed options on how to increase revenue to better address the short fall of road maintenance funding. Some opportunities may exist to increase road maintenance funding through Recreation Fee DEMO for the developed campgrounds, and to ensure that special-use permit holders pay their fair share of road maintenance where appropriate. One way for this forest to increase revenues would be to enter and harvest the suitable timber base identified in the 1985 Forest Plan. However, this approach would not address long-term road maintenance funding needs and would, in fact, increase the Forest road maintenance obligation as more roads were constructed. The most obvious approach to reduce road maintenance costs while increasing revenue would be to more intensely manage the suitable timber base that currently has road access. Timber purchasers would be required to perform road maintenance on the roads they use, and the Forest would collect surface rock replacement funds from the purchasers to help keep these access roads better maintained to standard.

EC (2): How does the road system affect the priced and non-priced consequences included in economic efficiency analysis used to assess net benefits to society?

This is a project-scale question, not a forest scale question.

EC (3): How does the road system affect the distribution of benefits and costs among affected people?

This is a watershed-scale question, not a forest scale question.

Commodity Production (TM, MM, RM, SP, SU)

Timber Management

TM1: How does the road spacing and location affect logging system feasibility?

This question is most applicable at the subforest scale during project analysis. It is an important consideration, however, for determining timber suitability, management area allocations, and economic efficiency during a forest plan revision.

Most sales on the Medicine Bow are logged with ground-based equipment. The trees are either felled by hand with chain saws or cut mechanically with a feller buncher and then yarded to the landing with rubber tired grapple skidders. In general, a road spacing of 2,000-3,000 feet would be economical for ground-based skidding.

The cut-to-length logging system has been tried in several places on the Medicine Bow National Forest and within Region 2. This system uses a mechanical processor that cuts, limbs, and bucks the logs to length, at the stump. The logs are then brought to the landing on a forwarder. It is possible to yard logs longer distances with a forwarder and thus the road spacing can be a little wider. However, due to high purchase price and relatively low cut volumes per acre, the cut-to-length system has not proven to be more economical than conventional rubber tired systems in this Region. If cut-to-length systems are required in timber sales to increase road spacing, stumpage values will be reduced and there will be a greater chance of no-bid timber sales.

Another reason the cut-to-length system has not been utilized much on this Forest is that it is a short log (less than 25 feet) system. Most of the log trucks and sawmills in this area are designed and equipped to haul and handle long logs.

In general, close road spacing results in quick turn times and higher production that reduces yarding cost and increases stumpage value. Although closer road spacing can increase the total road cost due to more roads, this total cost can be reduced with the use of temporary roads.

Cable logging systems are not common within Region 2 and have seldom been used on the Medicine Bow National Forest. The road location is particularly important for cable logging. Most cable logging systems employ uphill yarding and roads located above the unit and along the "break" (where the slope changes from gentle to steep) provide better cable deflection that usually increases production and reduces ground disturbance. Long cable yarding distances (greater than 1,600 feet) require larger size equipment and wider roads. The amount of steep slope cable yarding opportunities will be analyzed during the suitable timberland analysis for the Forest plan revision.

Helicopter logging has recently been used in this Region, on a limited base. This logging system is extremely expensive. Most of the Medicine Bow is located at a high elevation and because of that, a helicopter's lift capacity is greatly reduced, which makes helicopter logging even more expensive on this Forest. The only way a helicopter system can be used economically here, with our usual stumpage values, is to have several other low-cost, ground-based units included in the timber sale to offset the cost. Helicopter logging feasibility is improved by locating roads and landing to provide downhill yarding and short yarding distances (less than ½ mile).

Generally, road construction is only allowed where it is determined to be economically and technically necessary to achieve resource management objectives. The most efficient road spacing that would maximize timber stumpage values is not acceptable because it usually conflicts with other resource management objectives.

TM 2-3: How does the road system affect managing the suitable timber base and other lands? How does the road system affect access to timber stands needing silvicultural treatment?

Lands suitable for timber management in the Forest Plan were determined by:

1) Identifying all forested land from nonforested land.
2) Subtracting forested land not available including: wilderness areas, research natural areas, wild and scenic river corridors, powerline corridors, and administrative sites such as campgrounds.
3) Subtracting forested land with non-industrial wood such as pinyon/juniper, limber pine, Gambel oak, and cottonwood.
4) Subtracting forested land where irreversible damage is likely to occur if managed for timber production.
5) Subtracting forested land where restocking cannot be assured within five years.
6) Subtracting forested land where adequate response information is not available. These are areas where there wasn't enough information to predict response to timber management. These areas cannot be considered part of the suitable land base until further inventory is collected.

The result of the above steps was the land identified as tentatively suitable for timber management. The Forest Plan identified 627,864 acres out of the 1,665,860 total Medicine Bow National Forest acres as tentatively suitable.

7) The last step in the suitability analysis was to determine the suitable land from the tentatively suitable land base. This step excluded the lands identified as not appropriate for timber production because they were assigned to other resource uses to meet forest plan objectives.

When the Forest Plan was signed in 1986, 447,555 acres were identified as land suitable for timber management. The Allowable Sale Quantity was calculated from growth and yield projections based on these areas only. During the last 15 years of forest plan implementation, as the Forest conducted project level planning, ID teams have further refined the suitable timber base. Project-level ID teams have concluded that some stands in the suitable base are incompatible with management area prescriptions (they are too rocky, too wet, have unstable soils, etc.) and those acres have been removed from the suitable land. Another larger scale effort identified forested riparian areas as not suitable for timber management and those acres were removed from the suitable land base. The FY2000 Forest Plan Monitoring Report showed there are now 401,662 acres in the suitable timber base. Now, as the Medicine Bow National Forest prepares their first forest plan revision, the suitable timberland will be reanalyzed and what we learned from project level analysis in the last 15 years will be used in the Forest Plan Revision Suitability Analysis.

Timber management on the suitable timberland and on other tentatively suitable timberland where timber management may be needed to meet desired future condition is economically feasible only if road access is present. Without an adequate road system, the 1985 Forest Plan management objectives and prescription for the suitable timber base and other commodity resources cannot be accomplished. At the scale of this roads analysis, we will only consider the arterial and collector road systems.

According to the Forest Plan (EIS, page IV-127), there were 741 miles of new road construction planned during the first ten-year planning period (1986-1995). Road reconstruction for that same planning period was estimated to be 339 miles. A large part of this planned road construction and reconstruction was to provide access to the suitable timberland.

If we look just at the arterial and collector road system, according to the Forest Plan Management Area Prescription Map, 48.4 miles of new arterial or collector road construction was scheduled for the first ten-year planning period. During the last 15 years, 2.2 miles of that ten-year scheduled road construction was accomplished.

The Forest Plan also scheduled 152.7 miles of arterial or collector road reconstruction during the first ten years of the plan. During the last 15 years, 63.7 miles of that ten-year scheduled road reconstruction was accomplished

To get an indication of the amount of suitable land that currently has no road access, the suitable timberland base was compared to the roadless inventory prepared for the ongoing forest plan revision effort. The result of this query indicates 81,633 acres or 20 % of the Forest Plan suitable timberland is in inventoried roadless areas and thus does not have road access for management. Some of this unroaded suitable timberland could be accessed through temporary road construction or by constructing or reconstructing local roads. If a detailed transportation system analysis was conducted for the suitable land in the inventoried roadless, the amount of arterial or collector roads needed to provide access would probably be close to 46 miles of new construction and 89 miles of road reconstruction. This estimate is the balance of the roads planned in the 1985 Forest Plan.

A detailed transportation system analysis for the unroaded portion of the Forest Plan suitable land was not undertaken because the suitable timberland will probably change soon, as part of the analysis for the forest plan revision effort. More detailed transportation system planning will be done during subforest and watershed scale analyses.

The management decision on whether to providing access to unroaded portions of the suitable land will be made in the forest plan revision. On June 7, 2001, Forest Service Chief, Dale Bosworth, directed Regional Foresters to "ensure that forest plan amendments and revisions consider, as appropriate, the long-term protection and management of unroaded portions of inventoried roadless areas." This direction is apparently much the same as the direction in the planning regulations. 36 CFR 219.17 states:

> "Unless otherwise provided by law, roadless areas within the National Forest System shall be evaluated and considered for recommendation as potential wilderness areas during the forest planning process…"

The forest plan revision process will inventory (currently, substantially complete), evaluate, and make recommendations on how to manage roadless areas. A full range of management alternatives will be considered during the plan revision process. Some alternatives might provide access to unroaded areas for timber management and for other active resource management while some alternatives might recommend part of the roadless areas be placed in permanent wilderness designation. Until the Forest Plan is revised, the Chief will be the deciding officer on decisions to construct roads in inventoried roadless. Because the Medicine Bow National Forest has already released the forest plan revision roadless inventory, road construction in the inventoried roadless areas will not be proposed during the remainder of the forest plan revision process.

Minerals management

MM1: How does the road system affect access to locatable, leasable, and salable minerals?

Affected Environment: Minerals and Geology:

The Forest Service administers its minerals program to:

1) Encourage and facilitate the orderly exploration, development, and production of mineral resources from National Forest System lands, and,
2) Ensure that exploration, development, and production of mineral resources are conducted in an environmentally sound manner and that these activities are integrated with planning and the management of other National Forest recourses. (FSM 2802)

Mineral resources are separated into three categories: locatable, leasable, and saleable.

Locatable Minerals are those deposits subject to location and development under the General Mining Law of 1872 (as amended). The Forest Service does not manage the mineral resources on National Forest System lands. That authority rests with the Secretary of the Interior. Forest Service authority is directed at the use of the surface of National Forest System lands in connection to the operations authorized under the United States mining laws (30 U.S.C 21-54), which confer a statutory right to enter upon the public lands to search for minerals. Forest Service regulations at 36 C.F.R. 228, Subpart A provide that operations shall minimize adverse environmental impacts to the surface resources, which includes the following"

- Using all practicable measures to maintain and protect wildlife habitat affected by an operation.
- Reclaiming surface disturbances, where practicable.
- Rehabilitating wildlife habitat.

Additionally, the regulations require that roads needed for mineral activities shall be constructed and maintained to minimize or eliminate damage to resource values (including wildlife). Unless otherwise authorized, roads that are no longer needed for operations shall be closed to normal traffic, bridges and culverts removed, and the road surface shaped to as near a natural contour as practicable and stabilized.

The Medicine Bow National Forest is open under the general mining laws in which the right of exclusive possession is vested in the discovery of a valuable mineral deposit. The existing road system has been sufficient to meet locatable requests to date. Some areas of public lands located within the jurisdictional boundaries of the Medicine Bow National Forest have been withdrawn from mineral entry through the Bureau of Land Management. This means mineral entry/activity of any sort are not allowed. These areas include, but are not limited to, Congressionally designated Wilderness areas, Research Natural Areas, National Recreation Areas, Administrative Sites, Special Interest Areas, etc. Locatable minerals are addressed in the 1985 Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan, Page III 53-56.

Access is provided to people with mineral rights throughout the Forest and these routes may be closed to the general public. Arterial and collector roads are used to access individual claims and access is addressed on an individual basis. The vast majority of roads constructed into mining claims are/will be temporary. Where reconstruction/construction and reclamation are necessary for access, bonding is required as part of Operating Plans or Notice of Intent.

Leasable Minerals are federally owned fossil fuels (oil, gas, coal, oil shale, etc), geothermal resources, sulfur, phosphates, and uranium. These minerals are subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior, with Forest Service consent. The 1920 Mineral Leasing Act (as amended) together with the 1989 Federal Onshore Oil and Gas Leasing Reform Act provide the authority and management direction for federal leasable minerals on National Forest System lands. In addition, mineral leasing on the Grasslands is authorized under the 1947 Mineral Leasing Act for Acquired Lands.

Withdrawals of unclassified lands from operations of the mineral leasing acts are requested only in exception situations. Classified lands, other than wilderness, which are not by law or otherwise withdrawn from operations under the mineral leasing acts include Wild and Scenic Rivers, National Recreation Areas, National Historic Sites, Natural Areas, and other specific classifications. In these areas, the Forest Service recommends leasing activities only when terms and conditions can be applied that will protect the purpose for which the lands were classified.

Road access for leasable minerals is generally planned and developed on a large grid and on a individual basis. Production of leasable minerals will require some high-standard haul roads. Existing arterial and collector roads are utilized to access the general proximity and are sufficient for that purpose. Transportation plans are generally developed as part of each leasable activity.

Salable Minerals include mineral materials, otherwise known as "common varieties" which generally include deposits of sand, gravel, clay, rock or stone used for a number of purposes including road surfacing, construction materials, and landscaping. The disposal of these materials is by a materials contract issued at the discretion of the Forest Service. All contracts contain requirements for reclaiming the sites, as much as practicable, to pre-mining conditions.

Existing arterial and collector roads are sufficient to gain access to the general proximity of salable proposals. The value of salable common variety minerals is very sensitive to transportation costs. However, the Forest Service has total discretionary authority for disposal of common variety minerals and is not obligated by any statutory requirements.

Range management

RM1: How does the road system affect access to range allotments?

The network of roads on the Medicine Bow National Forest lands is perceived as having positive indirect effects (negative effects may exist but are unknown) on rangelands and positive direct effects on the administration of the grazing program. Roads have mostly replaced driveways as a means for transporting sheep and cattle to and from mountain allotments. As a result, the vegetative condition and overall health of these driveways (there were many on the Sierra Madre Division) have improved dramatically. Until the 1970s, livestock driveways were considered "sacrifice areas" in the range-management discipline (Stoddart and Smith 1955).

The road network on the Medicine Bow National Forest has increased the administration capability of the range management program. Administratively, the road network now allows range conservationists to access allotments quickly by using vehicles rather than horses. Grazing permittees have likely experienced lowered operating costs by having motorized access to allotments.

Essentially there is no scientific information for analyzing the effect of the existing Medicine Bow National Forest road system on the range management program. Preliminary unpublished analyses from the interior Columbia River basin ecosystem management project addressed the road issue from the perspective of ecological responses to the presence or absence of roads. The analyses found correlations between changes in vegetation composition, riparian functioning, and fire regimes and the presence of forest roads. The investigators could not conclude any cause-and-effect relations from these correlations, however. The study also found that higher road densities were associated with diminished ecological integrity, including those based on range criteria (Inland Columbia River Basin Project 2000).

A Forest Service ad hoc interdisciplinary team was formed to provide a nominal assessment. This team performed much of their assessment deliberations in Forest Service, Region 2. The team found that roads in National Forests are essential for administering the grazing program. Compliance enforcement was particularly mentioned as an activity that greatly benefits from forest roads. Roads also allow timely access to allotments. Many allotment plans incorporate Forest Service roads into their approved grazing system or as driveways to and from the allotment. The team found that roads can reduce permittee operating costs by providing motorized access to allotments. The team estimated that, if none of the National Forest roads were available for motorized access, permittee costs would increase by 3 to 5 times. These costs would accrue from increased riding time, cost of horses and riders, and added equipment costs (such as horse trailers). The grazing program was estimated to derive benefit from only part of the road system, however, and if arterial and collector roads remained open, the expected cost increases would be from 0 to a 2-fold increase (Gucinski et al 2000). `These findings appear compatible with local experience on the Medicine Bow National Forest. The existing system of maintenance level 3, 4, and 5 roads, if diminished, would have a definite economic affect on Medicine Bow Forest administration and permittee economics.

No peer-reviewed studies have assessed the effects of national forest roads, or roads in general, on livestock grazing or ecosystem management. Results from the Columbia River basin program are tentative and show no causal relations. The results of studies examining the influence or roads on forested landscapes must be carefully extended because the results from studies in eastern forests may not apply to western forests (Miller, et al 1996).

Summary: Medicine Bow National Forest maintenance level 3, 4, and 5 roads are an important part of range allotment plans. The maintenance level 1 and 2 roads are also serving adequately to access the allotments. Roads are also a very important component of the compliance and administration of the Forest's grazing program. Ecologically, roads may or may not have a negative effect on rangelands; and also, the environmental effects of not having roads are unknown. The national ad hoc team produced findings that are applicable to the Medicine Bow National Forest—specifically, no science-based information was found on how National Forest roads affect livestock grazing. Many questions remain, including the actual cost of any closures to permittees and the effects of any road closures to administering range management programs, including the weeds program, and compliance.

Water Production (WP)

WP1: How does the road system affect access, constructing, maintaining, monitoring, and operating water diversions, impoundments, and distribution canals or pipes.

The existing road system is sufficient to access existing water diversions, impoundments, and distribution canals and pipes. The larger impoundments and diversions tend to be accessed by the arterial and collector roads. However, the Forest does have numerous agricultural ditches and reservoirs that are closed to public access and are accessed by the permittees on a "by request" basis only. This access is for inspection and maintenance only and is required by their permit. Public motorized access on these roads is generally restricted, and extensive use by the permittee is usually addressed with maintenance requirements in their permit.

WP2: How does road development and use affect water quality in municipal watersheds?

This is addressed by project on a case-by-case basis for road development. Thus far, use has not been identified as a concern or problem for water quality in the existing municipal watersheds.

WP3: How does the road system affect access to hydroelectric power generation?

The Medicine Bow National Forest does not have any hydroelectric power generation facilities.

Special Products (SP)

SP1: How does the road system affect access for collecting special forest products?

The current maintenance level 3, 4, and 5 road system provides adequate access for collecting special forest products such as mushrooms, recreational rock collections, ferns, transplants, Christmas trees, firewood, and etc. If road closure or seasonal closure is considered in a project or watershed analysis, access for special forest products will be considered.

Special Use Permits (SU)

How does the road system affect managing special-use permit sites (concessionaires, communication sites, utility corridors, and so on??

The existing road system is sufficient to deal with almost all recreation special uses. Safe and efficient access to areas under Special Use Authorization has a direct effect on the economics of an operation, either thru volume of customers, or operation and maintenance costs. Most recreation special use proposals/authorizations are designed around the existing road system.

Access and Forest Service responsibility under ANICLA and R.S.2477 are discussed in the General Public Transportation (GT) report for this document. The Medicine Bow National Forest and Thunder Basin National Grassland has 1400 +/- non-recreation Special Use Authorizations. Many of these uses rely on the existing road access or utility corridors to accommodate construction, operation, and maintenance. Most leasable mineral requests require reconstruction of old roads or new construction to meet their needs. These requests are analyzed thru the NEPA process and are address in the associated decisions.

General Public Transportation (GT)

GT (1): How does the road system connect to public roads and provide primary access to communities?

National Forest system roads connect numerous public roads managed and operated by either the state of Wyoming or county governments. However, few Forest roads serve as the primary through-routes that connect communities. Of greater importance is how the county roads and state highways give communities, tourists, and industries access to the National Forest. These roads connect to arterial, collector, and some local roads at the Forest boundary where traffic is dispersed into the Forest for a variety of uses. Some county and state highways traverse into or through the National Forest. The following table lists public roads identified as important to linking the National Forest to public roads and local communities.

Table 9. Public roads under county or state jurisdiction that access to the National Forest.

Public Road Number/Name	Termini
Albany County	
25 / Boswell	WY St. Highway 230 – WY St. Highway 10
47 / Fox Cr.	WY St. Highway 230 – WY St. Highway 11
71A / Harris Park Road	County Line – County Road 71
716 / Fletcher Park Road	County Line – County Road 71
71 / Cottonwood Park Road	Platte Co. Rd. 71A – County Rd. 721
77 / Bear Creek Road	County Road 713 – F.B., NFS Road 671
710 / Esterbrook Road	County Road 61 – County Line
5 / Esterbrook Road	WY St. Highway 94 – County Line
61 /	NFS Road 658 – County Line
62 / Little Medicine Road	County Line – Converse Cty. 24

Public Road Number/Name	Termini
Carbon County	
(NFS Road 111) / West Fork Foote Creek	WY St. 80 – F.B., NFS Road 111
101 /	Elk Mountain – F.B., NFS Road 101
404 /	WY St. Highway 130 – F.B., NFS Road 115
660 / French Cr. Road	WY St. Highway 230 – F.B., NFS Road 500
754 / Sandstone Divide Trail	WY St. Highway 70 – F.B., NFS Road 852
710 / Little Snake River Road	WY St. Highway 70 – State line
798 /	WY St. Highway 230 – F.B., NFS Road 468
211 / East Cottonwood Creek	WY St. Highway 230 – F.B., NFS Road 409
/ Water Valley Ranch Road	County Road 353 – Encampment River Trailhead
353 /	WY St. Highway 70 – F.B., NFS Road 405
387 / South Spring Creek	WY St. Highway 130 – BLM land, NFS Road 440
385 / Transfer Trail	WY St. Highway 130 – F.B., NFS Road 440
500 /	WY St. Highway 130 – Co. Rd. 401
401 / Sage Creek Road	WY St. Highway 71 – F.B., NFS Road 801
Routt County, Colorado	
129 / Little Snake River	State Line – NFS Road 551
Jackson County, Colorado	
6W /	CO St. Highway 125 – F.B., NFS Road 407
Platte County	
71A / Harris Park Road	County Road 114 – County Line
114 / Fish Creek Road	I 25 – County Road 133
133 / Fletcher Park Road	County Road 114 – County Line
Converse County	
16 /	County Road 24 – County Line
24 /	County Road 16 – County Line
17 /	County Road 18 – Forest Boundary
Wyoming State Highways	
11	WY St. Hwy. 130 – F.B., NFS Road 500
94	Douglas – Converse Co. Rd. 5

Public Road Number/Name	Termini
Wyoming State Highways, cont.	
91	WY St. Hwy. 96 – Converse Co. Rd. 24
210	Interstate 80 – F.B., T14N, R71W, S12
230	Laramie – State Line
230	State Line – WY St. Hwy. 130
130 / Snowy Range Highway	Laramie - Saratoga
70 / Battle Highway	WY St. Hwy. 230 – WY St. Highway 789
Colorado State Highways	
127	CO St. Hwy. 125 – State Line
125	CO St. Hwy. 127 – State Line

The Medicine Bow Forest road system does not provide any primary access routes to or between communities. However, these communities use several Forest roads for recreation and commercial access to the National Forest. The 2000 census estimates the population of the five counties surrounding the Forest at just over 135,000 people. As population increases, recreation and commercial use of the road system is also expected to increase.

The following table lists major population centers and public and Forest System roads used for primary access to the National Forest.

Table 10. Primary county, state, and forest roads providing access to and through the National Forest.

Community, Town, or City	Public Roads	National Forest System Roads
Cheyenne, WY (State Capitol) Also see Laramie, Wheatland	Interstate 80 Interstate 25 WY St. Hwy. 210	700, Vedauwoo Glen 701, Caretakers
Laramie, WY	Interstate 80 WY St. Hwy. 210 WY St. Hwy. 230 WY St. Hwy. 130 WY St. Hwy. 11 Albany Cty. Rd. 47	101, Sand Lake Road 111, Arlington 311, Fox Creek Road 351, Barber Lake 700, Vedauwoo Glen 701, Caretakers 705, Blair Wallis 500, French Creek 517, Dry Park
Saratoga, WY Also see Encampment/Riverside	WY St. Hwy. 130 Carbon Cty. Rd. 500 Carbon Cty. Rd. 385 Carbon Cty. Rd. 387	100, North Brush Creek 225, Lower French 440, Vulcan Mountain 452, Jack Creek 801, Deep Creek

Community, Town, or City	Public Roads	National Forest System Roads
Encampment/Riverside also see Saratoga	WY St. Hwy. 70 WY St. Hwy. 230 Carbon Cty. Rd. 211 Carbon Cty. Rd. 353	409, Blackhall Mtn. 550, Hog Park 443, Jerry Acord 801, Deep Creek 807, Battle Creek
Wheatland, WY	Interstate 25 WY St. Hwy. 310 Platte Cty. Rd. 133 Albany Cty. Rd. 716 Albany Cty. Rd. 71	633
Douglas, WY	Interstate 25 WY St. Hwy. 94 WY St. Hwy. 91 Converse Cty. Rd. 5 Converse Cty. Rd. 16 Converse Cty. Rd. 24 Converse Cty. Rd. 17 Albany Cty. Rd. 61	633, Harris Park Road 671, Bear Creek Road 658, La Bonte Canyon 629, Box Elder 660, Basin Road
Medicine Bow	WY St. Hwy. 287 WY St. Hwy. 487 Albany Cty. Rd. 62 Albany Cty. Rd. 61 Albany Cty. Rd. 710 Albany Cty. Rd. 77 Converse Cty. Rd. 24	629, Box Elder 660, Basin Road
Casper	Interstate 25 WY St. Hwy. 251 Natrona County - Medicine Bow Road Converse Cty. Rd. 17 Converse Cty. Rd. 18 Converse Cty. Rd. 24	629, Box Elder 660, Basin Road

These roads and others are important to and used by smaller communities around the Forest. Many people in these communities rely on access to the Forest for their livelihood as well as for recreation. The Forest is important for mining, timber, ranching, and tourism. Some of those communities are listed in the following tables.

Table 11. Small residential communities near the Medicine Bow National Forest.

Albany County:	Albany, Arlington, Bosler, Buford, Centennial, Foxpark, Jelm, McFadden, Mountain Home, Rock River
Carbon County:	Baggs, Dixon, Elk Mountain, Hanna, Walcott
Platte County	Chugwater, Glendo, Guernsey, Slater
Converse County	Glenrock
Natrona County	Alcova, Bar Nunn, Evansville, Mills

GT (2): How does the road system connect large blocks of land in other ownership to public roads?

The amount and dispersion of private and other ownership lands vary across the four geographic areas. Most of these lands are accessed by arterial and collector roads. However, some are accessed by lower standard local roads and some by no roads at all, such as in roadless areas or wilderness. Access needs to inholdings are addressed on an individual basis as requests are received. Forest Service policy is that access will be provided to a level that is reasonable and suitable for the uses occurring on the land. When landowners desire access, they are asked to apply for a special use or road use permit. The application is then analyzed through the NEPA process to determine possible environmental effects and the level of reasonable access required. When subdivision occurs on larger private parcels, the Forest policy is to require the landowners create an association or some type of consolidated organization to represent all of the landowner interests. This eliminates the need for the Forest to enter into road use or special use permits with each individual landowner. Access is normally limited to summer or non-snow periods, but on occasion; permits are issued for snow plowing during the winter. Responsibilities for improvements and maintenance should be determined through a commensurate share process. If access is being provided by a public road agency such as the county or state, then the Forest Service may not be obligated to provide any additional access over federal lands. When larger developments or subdivisions occur and inholding traffic is expected to exceed that generated by the users of the National Forest, agency policy is to pursue turning jurisdiction of the Forest road over to another public road authority such as the county or state.

There are very few private or other ownership lands in the Pole Mountain analysis area. Private or county roads outside national forest system land provide access to those that do exist. For private land on the east side of the area, State Highway 210 provides access to Interstate 80 on a year-round basis. Forest Road 700 can be used as an alternative route in the snow-free season. These are the only primary routes that provide connections in this area.

In the Snowy Range area, scattered inholdings rely on Forest system roads for vehicular access. In the southern portion of the Snowy Range, private landowners at Foxpark, (an area near Somber Hill) have been pressing for year-round access. Albany County has indicated a willingness to take responsibility for Forest Road 512 from Highway 230 to the private lands. If year-round access becomes necessary, the Forest should pursue transferring jurisdiction. Some smaller lots along French Creek and a few fairly large private parcels near Rob Roy reservoir are used for summer recreation residences. Forest Roads 500, 507, 512, and 542 are the primary access routes to these areas. These roads connect the private lands to State Highways 11 and 230. There are four state land parcels in this area. All have good road access.

In the northern portion of the Snowy range, Forest Road 100 provides access to both private and state lands. This road also provides cross-Forest access to State Highway 130 (Snowy Range Scenic Byway) for private and state land north of the Forest. The other main access in this area is Forest Road 101. This road also traverses from north to south connecting a few small parcels of private land and one state section to Carbon County roads in the north and State Highway 130 in the south. Forest Road 111 is also used to access Interstate 80 at Arlington.

There are more private inholdings and state sections in the Sierra Madre Range. State Highway 70 bisects the National Forest connecting the town of Encampment on the east side to Baggs, WY on the west. This highway is a designated Forest Highway but is not kept open during the winter. Forest Roads 801, 452, and 440 connect several small parcels to both the state highway in the south and Carbon County roads entering the Forest from the north. Forest Road 801 is also federally designated as a Forest Highway. This road ties State Highway 70 to Carbon County Road 401 and eventually the city of Rawlins, WY. The Hog Park road is a Forest arterial road that connects State Highway 70 in Wyoming to the Routt National Forest and Routt County Road 129 in Colorado. This road eventually connects to Colorado State Highway 40 and the city of Steamboat Springs, CO. Traffic from Colorado has become increasingly significant during the summer and the Forest and Carbon County officials are discussing opportunities, one of which is designating this road as a Forest Highway. County Road 129 is already a designated Forest Highway (Colorado FH 20, Hahns Peak). A development proposal has been presented to Carbon County for a new ski area with over 250 residential units on a section of private land along Forest road 550 near Dead Horse Park. Should this development come to pass, there would be pressure to keep the road open during the winter to provide Routt County residents with access to the ski area. Developing this road as a Forest Highway and turning jurisdiction and operational responsibilities over to the counties is a possible course of action. Road 409 is another major through-route connecting private and state lands to the towns of Encampment, WY and Cowdry and Walden, CO. In the southwest portion of the Sierra Madre Range, Forest Roads 807 and 851 connect smaller parcels to State Highway 70.

The Laramie Peak area has the most extensive intermingled private and state land within the Forest boundary. There are six primary routes crossing the National Forest. Most of the routes are under county jurisdiction and are already public roads. These routes connect the Forest to communities, state highways, and Interstate 25. Four counties also come together over this area of National Forest: Platte, Albany, Natrona, and Converse. Many private and state lands in this area are accessed from the county roads by lower standard (maintenance level 2) Forest roads. Special use or road use permits have been issued to some landowners to assign responsibilities for maintenance. As funding and personnel are made available, more landowners are contacted, but the workload is well beyond current funding and staffing levels. Occasionally problems arise on some access roads resulting in the landowner contacting the agency to request repairs. This contact serves as an opportunity to initiate discussions with the landowners about access rights and responsibilities.

Some inholdings are not connected by public roads. The Box Elder Road, Forest System Road 629, is a level 2 maintenance road over which the Forest Service has acquired the right-of-way over nearly the entire length. The Forest's objective for this road is to acquire all right-of-way along the entire length and upgrade the road to maintenance level 3. The road provides people from Casper, Glenrock, and Douglas with access to National Forest, Bureau of Land Management, and state lands. There are numerous residences along this road and transferring jurisdiction to the county needs to be considered. This road connects to Converse County Road 17, which goes to Glenrock, WY. Converse County Roads 24, 16, 710, and 71 and Albany County Road 721 are the other routes traversing the Forest. The Russell's Camp Road (Road # 607) is another private road that the Forest has identified as important for access to the National Forest. This road also connects private land to the county public road system. In most areas, the Forest Service lacks adequate legal access to the public system. Acquiring public access in this area competes with demands for access acquisition on the rest of the Forest. Priorities for access are usually identified during planning for commercial or land management projects.

The Forest Service is currently identifying a portion of its road system for public designation. These roads will be open and available to the traveling public on a regular and consistent basis. Public Forest Service roads will be maintained for passenger access and provide unrestricted access (except when there are seasonal snow closures, emergency closures, or scheduled closures such as for wildlife) to and through the National Forest. Coordination with county officials is ongoing.

GT (3): How does the road system affect managing roads with shared ownership or with limited jurisdiction? (RS2477, cost share, prescriptive rights, FLPMA easements, FRTA easements, DOT easements)

Numerous roads crossing the National Forest fall under the jurisdiction of agencies other than the Forest Service. When desirable, cooperative agreements should be established to share road improvement and maintenance responsibilities when all partners can benefit. The Forest Service, Federal Highway Administration and the Wyoming Department of Transportation signed a Memorandum of Understanding (MOU) in 1997. This document set forth general procedures for planning, programming, environmental studies, design, construction and maintenance of designated Forest Highways. The forest highways currently designated by the Federal Highway Administration are listed in the following table

Table 12. Forest Highways on the Medicine Bow National Forest.

Forest Highway Route No./Name	Description	County	Length (miles)
11/Battle Lake Road	This route starts at the junction with State Highway 789 in Baggs, WY and proceeds easterly 56.7 miles over St. Hwy. 70 to the junction with St. Hwy. 230 in Riverside, WY.	Carbon	56.7
12/Snowy Range Road	This route starts at the junction with St. Hwy. 230 south of Saratoga, WY and proceeds easterly ___ miles over St. Hwy. 130 to the junction of St. Hwy. 11 east of Centennial, WY.	Carbon and Albany	——
26/Sage Creek Road	This route starts at the junction with St. Hwy. 70 (FH-11) west of Encampment, WY and proceeds northerly 9.9 miles over Forest Road 801, 34.0 miles over Carbon County Road 401 and 10.8 miles over St. Hwy. 71 to Higley Street in Rawlins, WY.	Carbon	54.7
29/ Douglas – Esterbrook Road	This route starts at the Albany/Converse County Line, east of Esterbrook, WY and proceeds northerly 1.4 miles over Forest Road 633, 10.6 miles over Converse County Road 5 and 16.6 miles over St. Hwy. 94 to I-25 Business in Douglas, WY.	Converse	28.6

Portions of these forest highways are still under the jurisdiction of the Forest. When funding is secured and improvements are made to bring these sections to Federal Highway Administration standards, they will be turned over to either the state or county. The Forest needs to cooperate with these agencies by supporting them in their efforts to obtain funding through the Federal Lands Highway Program.

At present, there are no formal agreements between the Medicine Bow National Forest and any of the Wyoming counties to share in road operations or maintenance. During consultation with county officials, Carbon, Albany, Converse, and Platte counties indicated an interest in pursuing Forest road agreements in the future. These agreements would identify county and forest system roads that would benefit from mutual cooperation for maintenance and improvements needed for public, administrative, and commercial access to the National Forest.

There are no cost-share agreements with private or public landowners on the Forest. The diversity of ownership and lack of any sizable inholdings does not indicate a need to pursue agreements of this type.

Rights of access by law, reciprocal rights, or easements are recorded in Forest files and county courthouse documents. The Forest recognizes these rights and works with the owners to preserve access while protecting the natural resources and facilities on adjacent National Forest Lands. There is also an understanding by the Forest Service that individuals or entities may have established valid rights, unknown to the Forest Service at this time, to occupy and use National Forest lands and roads. The courts have established that such valid outstanding rights may be subject to some federal regulation. See *Sierra Club v. Hodel,* 848 F 2d. 1068 (10th Circuit, 1988). This analysis recognizes that such valid outstanding rights may exist and the Forest Service will certainly honor such rights when it is subsequently determined that the specific facts surrounding any claim to such rights meet the criteria set forth in any respective statute granting such occupancy and use (see *Washington County v. The United States,* 903 F. Supp. 40 [D. Utah, 1955]).

GT (4): How does the road system address the safety of road users?

In 1975, the Forest Service developed a Memorandum of Understanding with the Federal Highway Administration that required the Forest Service to apply the requirements of the national highway safety program, established by the Highway Safety Act, to all roads open to public travel. In 1982, this agreement was modified to define "open to public travel" as "those roads passable by four-wheeled standard passenger cars and open to general public use without restrictive gates, prohibitive signs…" Most roads maintained at level 3, 4, and 5 meet this definition. Design, maintenance, and traffic control on these roads emphasizes user safety and economic efficiency.

The largest proportion of road maintenance and improvement funds allocated to the Forest is spent on these higher standard roads. Safety work such as surface maintenance, roadside clearing and installation and maintenance of warning and regulatory signs are performed on an annual basis. During the winter, these roads are not plowed open and some are subject to seasonal restrictions to prevent road damage during the early spring when the roads are drying out. Traffic control signing follows standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD). Exceptions are permitted where state or county practices on similar public roads deviate from these guidelines. Signing should conform with local practice in those situations where use of MUTCD guidelines would be confusing to the motorist.

When accidents occur on Forest roads, often the Forest Service is not immediately informed unless an employee is involved. Accidents involving only public motorists are reported to the local sheriff or state patrol, if reported at all. When the Forest does become aware of an accident, an investigation is initiated to attempt to identify the cause. If a feature of the road is found to be unsafe, addressing the condition becomes a high priority. Presently, there is no comprehensive program on the Medicine Bow National Forest for identifying accident locations and for maintaining surveillance of those locations having high accident rates or losses as is required by Highway Safety Act. The Forest needs to address this area of non-compliance.

Road condition surveys conducted in 1999 and 2000 reveal a backlog of over $5.7 MM in deferred health and safety work items on level 3-5 roads in the analysis area. A large portion of this backlog is a result of deteriorated road surfacing on aggregate-surfaced roads. In the past, road-resurfacing projects were planned as part of commercial timber sale activities. The decline of this program has reduced the Forest's ability to fund this work. Many arterials and collectors do not meet standards for alignment or roadbed width. Built originally for commercial use, design considerations did not emphasize the high volumes of public recreational traffic that the roads are experiencing today. Many roads are lacking sight distance, turnouts, and adequate lane width needed for the higher volume and speed of traffic now occurring. Another high-cost item is roadside brushing. Level 3, 4, and 5 roads need to be placed on a recurring schedule to maintain sight distance and a safe clear zone. While this work has been part of the annual maintenance program, it is often dropped in years when budget allocations are down. Finally, warning and regulatory signing contributes significantly to the backlog. Engineering studies are currently being conducted to determine the actual

warning sign needs on the higher standard roads. As funding levels permit, these signs are being installed. Sign maintenance after installation is part of the annual maintenance program of work.

Maintenance level 1 and 2 roads that intersect the higher standard roads need to be clearly distinguishable from those that are managed for passenger car use. This can be accomplished in a variety of ways. The surface type and condition of the lower standard road should convey the impression that a high clearance vehicle is needed. The route marker used to identify the road should be placed back from the intersection so it does not readily attract attention to the road. It should also be shaped so the number is vertically aligned and not of the distinctive or rectangular shaped signs used on level 3, 4, and 5 roads. The closure device on roads that are maintained at level 1 should be visible from the intersection or have a clear warning sign for traffic approaching the closure. During watershed and project-scale analysis, Forest officials should give high priority to recommending decommissioning those roads that pose the greatest risk to public safety.

Travel management regulations are posted on the ground and described on the Forest Visitor's map. These regulations have been established by the Forest to enable safe motorized travel while protecting natural resources and minimizing conflicts between users. A recent Forest Supervisor decision ended all unrestricted off-road travel by motorized vehicles on the Medicine Bow National Forest. Off-road recreational vehicles such as trail motorcycles and ATVs are discouraged on higher standard arterial and collector roads but not prohibited. Wyoming state law governs operation of off-road vehicles. Wyoming Statute 31-1-101 allows off-road vehicle owners to title and register their vehicles. These licensed vehicles can then be operated on public roads, including Forest Service roads. Vehicles not licensed may be operated only off-road or on designated motorized trails. This statute also applies to out-of-state visitors.

Administrative Use (AU)

AU1: How does the road system affect access needed for research, inventory, and monitoring?

The 1985 Medicine Bow Forest Plan's management prescription 10A was applied to Research Natural Areas (RNAs). The plan's standards and guidelines preclude road construction in RNAs. Trails are closed to motorized vehicles, and wildfires threatening the RNA are suppressed. Wildfires within the RNA are allowed to burn undisturbed unless they threaten persons or property outside the area, or the uniqueness of the RNA (General Direction 0380). Fire hazards are not reduced and no action is taken against endemic insects, diseases, or wild animals (General Direction 0382).

The 1985 Forest Plan identified one pre-existing Research Natural Area. In the Snowy Range Division, the Snowy Range Research Natural Area was designated as Management Prescription 10A. This area had been identified as a research preserve and managed as such since the 1930s. The University of Wyoming, Sam Knight Science Camp was located near the RNA and used the area for much of the University's botanical research for several decades.

The road system providing access to the designated RNA is adequate. Wyoming State Highway 130 provides several access points along the RNA's northern boundary. These access points are less than a mile from the RNA. The University Science Camp (no longer in operation) researchers always accessed the RNA via walking trails from the camp.

The 1985 Forest Plan identified the following six areas to be managed under management prescription 10C, Provides for Special Interest Areas (SIAs):

- Laramie Peak Division – Ashenfelder Basin
- Snowy Range Division – Medicine Bow Peak, Cinnabar Park, Dry Park, Libby Flats Ribbon Forest
- Sierra Madre Division – Gambel Oak Community on Battle Mountain

This prescription is similar to 10A in that management emphasizes unusual scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics.

All of these designated 10C areas have adequate roading to bring scientists, interested observers, and monitoring personnel into the areas. However, two 10C areas, the Gambel Oak Community (Sierra Madre Division) and the Ashenfelder Basin (Laramie Peak Division) have minimally adequate road access. Road 807 provides minimal access to the Gambel Oak Community. Road 807 is a maintenance level 3 road that joins Road 879, a maintenance level 2. There are also some minimal level 2, high-clearance-only sub- roads (879-1C, -1B) leading to the area. Minimal access to the Ashenfelder Basin SIA is provided by Road 633 (a maintenance level 3 road), several miles. miles of high-clearance sub-roads, and finally two miles of foot trail.

The 1985 Medicine Bow National Forest Land and Resource Management Plan is undergoing revision efforts. At this point in the plan revision process, 13 potential additional RNAs and 16 potential additional SIAs have been identified. The majority of these potential RNAs and SIAs are in the Snowy Range Division. This division is the most roaded of the four divisions. Should any/all of these potential RNAs and SIAs be designated, the existing roading system likely provides adequate to fully sufficient access for research, inventory, and monitoring.

Summary: In all four geographic divisions of the Medicine Bow National Forest, the road system appears provide adequate access for research, inventory, and monitoring.

AU2: How does the road system affect investigative or enforcement activities?

The level 3, 4, and 5 road system on the Medicine Bow National Forest generally provides good access for investigative and enforcement activities. These roads provide access to developed and dispersed recreation sites where many common violations occur. These roads also provide access to the many developed trailhead-parking areas for the trail system that provides backcountry access. While the road system provides access to perform investigative and enforcement activities, it also provided access for increasing public use of the National Forest System lands, hence, the Forest is experiencing an increase of criminal activities.

The FY2000 Draft Law Enforcement (LE) Plan for the combined forests lists 5 major criminal problem areas: 1) travel management, 2) unauthorized uses, 3) theft of forest products, 4) minors in possession of alcohol and illegal drugs, and 5) residential occupancy. While this Draft LE plan identifies several causes for each of these major criminal problem areas, they are all facilitated by the existence of a good road system.

Off-road motorized travel, primarily ATV use, is the most common travel management violation, and the level 3, 4, and 5 road system provides the access for these vehicles. The demand for ATV opportunities on the Forest is increasing, suggesting a need for more designated ATV trails. People driving around closed gates on level 1 roads is another travel management violation. With the implementation of the Medicine Bow Travel Management EA, the Forest has a tool to address user-created routes and unclassified roads.

Most of the unauthorized uses are in the form of illegal outfitting and guiding. Many of these violations are directly related to the level 3, 4, and 5 road system when non-permitted commercial driving tour operators attempt to derive a profit off of this road system. These roads also provide access to the backcountry trailheads where non-permitted commercial snowmobiling and hunting activities occur.

Theft of forest products is also usually directly related to the level 3, 4, and 5 road system. These violations mostly involve thefts of firewood, transplants, and Christmas trees. Some commercial level thefts of these products occur most years, and these thefts are usually dependant upon the level 3, 4, and 5 roads system. Sawtimber theft is also dependant upon this road system since it requires large log hauling vehicles.

There are increasing incidences of minors in possession of alcohol and illegal drugs on the Forest. Much of this activity is in the form of evening partying, which often occurs near the urban areas just off level 3, 4, and 5 roads. These gatherings often result in other resource and property vandalism.

While the road system on the Forest facilitates illegal activities, there are no known direct road-related causes of significant illegal activities.

Protection (PT)

PT1: How does the road system affect fuels management?

Fuels management objectives for the Forest are addressed in the Historic Range of Variability assessment during plan revision. However, for this roads analysis, a background on the forest vegetation and fire return intervals is appropriate for responding to this question.

The three most common forest vegetation types on the Medicine Bow National Forest are lodgepole pine, spruce-fir, and ponderosa pine. Generally, ponderosa pine stands occur on the eastern parts of the Forest; the Pole Mountain division is comprised mostly of the ponderosa pine type. Lodgepole pine and spruce-fir stands occur more generally in the central and western parts of the Forest, with spruce-fir being more common on northern aspects, in drainages, and at higher elevations. Limber pine is scattered and isolated across the Forest. It occurs on exposed ridges and in small contiguous stands in the western part of the Laramie Peak division. This forest vegetation type does not occur in enough significance for the purposes of response to this question.

Lodgepole pine occurs as even-aged stands with moderate to long fire intervals of 100 to 200 years and historic high-intensity, stand-replacing fires. As these stands age, they build dead fuel litter from the dead and dying trees within the stand. Often an understory of shade-tolerant subalpine fir will develop, adding ladder fuels which increase potential fire intensity. During the past 90 to 120 years, stand replacement fires burned much of the lodgepole pine on the Forest.

Ponderosa pine stands historically occurred as multiple-aged stands with limited understory because the short fire intervals of 20 to 50 years with low intensity fires burned out the understory vegetation and accumulated ground fuels. Over the past 80 years, fire suppression in this vegetation type has resulted in heavy accumulations of dead fuels and fire ladder understory growth in many areas of the Forest, especially in the eastern part of the Laramie Peak division. During the last 50 years, as fuels have built up, wildfires in these stands have become more intense. This results in larger, stand-replacing fires (e.g., Bear Head Fire, Douglas Ranger District, 1996).

Spruce-fir stands are mostly comprised of multiple-ages of Englemann spruce and subalpine fir. These stands experience long fire intervals of up to 500 years, with high-intensity, stand-replacing fires. Fire suppression activities during the past 80 years have not had much affect on this forest vegetation type due to the long fire intervals. These stands also occur in cooler and wetter growing sites so prolonged, dry weather conditions are necessary for these stands to be susceptible to stand-replacing fires.

The Medicine Bow National Forest road system provides overall good access for fuels management. The Forest recently initiated several major fuel reduction projects, and more projects are likely during the next several years. The focus of much of this fuel reduction planning is the urban interface, particularly the issue of public safety in these areas. Urban interface areas consist of summer cabins and year-round homes, and they generally have an adequate road access system for fuels management projects, including commercial harvest to meet fuel reduction objectives.

As fuel reduction planning begins to focus on unroaded areas of the Forest, road-related decisions may be necessary to provide access into these areas. Fuel reduction projects should include alternatives that don't require road construction to avoid prolonged and costly analyses due to inevitable social opposition. Fuel reduction projects in unroaded areas will likely occur in the southern parts of the Sierra Madre division due to the major blow down event that occurred in 1997. That event, combined with a subsequent high bark beetle epidemic potential, may result in a rapid increase in heavy, dead fuel loading during the next decade. If commercial harvest is considered as a fuel reduction tool, the current level 3, 4, and 5 road system in this part of the Forest may not be adequate for managing the anticipated fuel levels.

PT2: How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?

While the R2 Guidance determined this question is not normally a programmatic issue, the situation for the Laramie Peak division is different enough to warrant a response. This division has a highly fragmented landownership pattern combined with a very rough, rocky topography. Most of the level 3 and 4 roads in this area are county jurisdiction roads that are often in poor condition. Access through the private lands to the National Forest System lands is often on level 2 roads. Most of these roads are steep and difficult to drive, and they mostly exist in historic use locations where motorized travel was possible. Most of these roads were not located and constructed, as is often the case with timber access level 2 roads. Approximately 50% of the NFS lands in this division are within inventoried roadless areas. This road situation makes access for wildfire suppression more difficult and generally makes the response time slower. Difficult access and slow response time combined with the high wildfire frequency, heavy fuel loading, and a rapidly increasing urban interface is increasing the risk to humans and resource from catastrophic wildfires.

Another developing road-related concern for Laramie Peak is that many of the newer landowners are "locking up" access to the Forest. Historically, the residents of this area allowed the Forest Service unrestricted access to NFS lands to suppress wildfires and perform other land management projects. The Douglas Ranger District often acquired temporary administrative access through the private lands to accomplish project work, such as forest health and fuel treatments. Opportunities to secure unrestricted, permanent access were not realized. Increasingly, private landowners are installing locked gates on the National Forest System roads that pass thorough their private lands; the Forest Service does not have legal rights-of-way on these roads. Often these landowners must be contacted before the wildland firefighters are allowed to pass through these locked gates. This situation is slowing the Forest's response time.

The lack of legal access on the Laramie Peak division was identified as a planning problem statement in the 1985 Forest Plan. In response, the Forest developed a plan amendment which doubled the right-of-way acquisition "target." However, the Forest didn't make significant headway in securing rights-of-way until the 1990s. The project-scale roads analysis requirements for road-related projects present an opportunity for the Douglas Ranger District to consistently address acquisition of unrestricted access through private lands for roads where the Forest Service needs access for long-term land management activities.

PT3: How does the road system affect risk to firefighters and to public safety?

R2 Guidance identifies this question as being more appropriately responded to at the subforest scale. However, the Laramie Peak division discussion above is relative to this question. The slower wildfire response times on this Division, due to the road system, is increasing the risk to firefighters and to public safety. The longer it takes firefighters to respond to a reported fire, the greater the chances that fire will become larger and more difficult to suppress. The potential for catastrophic wildfires on this division is increasing; these catastrophic fires are more dangerous to firefighters, pose greater potential risk to public safety, and are more likely to cause structure losses.

PT4: How does the road system contribute to airborne dust emission resulting in reduced visibility and human health concerns?

Air quality impacts from the Forest road system are associated with vehicle emissions and dust from traffic on unpaved roads. These effects typically are localized and temporary, and their extent depends on the amount of traffic. Dust from unpaved roads increases with dryness as well as vehicle weight. Forest roads are usually unpaved and are used for recreational purposes (such as passenger car and four-wheel-drive use), as well as resource management purposes related to timber harvest, mining, and oil and gas development.

Motorized recreation occurs year-round. Summer use includes off-highway, two-wheel and four-wheel drive vehicles. When these vehicles travel on unpaved surfaces, they can stir up dust. The air quality data previously collected does not show any adverse impact to the air resource on the Medicine Bow National Forest. As use of Forest roads increases with visitation, road dust impacts to sensitive areas may need to be addressed.

Vehicular travel on unpaved roads can be expected to be heavy during resource management activities such as timber harvest, mining, and oil and gas development. These uses typically require dust abatement measures to reduce the air quality impacts of sustained and heavy traffic use. The Forest has applied dust abatement products to higher public use Forest roads that pass through or near residential areas as part of its annual maintenance plan when funds are available. Other mitigation measures may also be necessary, such as reducing haul speeds, watering, and limiting the number of trips per day and the time of day for operations. On unsurfaced roads, temporary increases in dust emissions occur during and after routine surface maintenance when conditions are dry. Watering during blading or scheduling maintenance when natural moisture content is higher would help reduce dust emissions.

Specifying the type of dust abatement product or method and frequency of use is not a programmatic issue. This is a relatively expensive activity and is dependent on budget levels and priorities. Dust abatement should be considered as a mitigation measure for higher traffic volumes resulting from commercial activities and special use permits, particularly on arterials and major collectors and when traffic is expected near developed recreation sites. It should also be considered on higher volume roads that are in riparian areas where dust could have unacceptable impacts to sensitive plants and animals.

Recreation

Recreation (UR1, RR1) Is there now or will there be in the future excess supply or demand for roaded or unroaded recreation opportunities?

This analysis concludes there is excess demand for both unroaded and roaded recreation opportunities on the Forest. There aren't enough unroaded recreation opportunities to satisfy demand. With roaded recreation, there appears to be many opportunities but not enough quality opportunities. These conclusions are dependent on recreation activities and on different mountain ranges.

Roads are the primary means of providing recreation on the National Forest. The supply of comfortable roads (maintenance level 4) has been decreasing due to lack of maintenance. Most of the roads on the Medicine Bow National Forest were built, not for travelers, but for timber harvesting, livestock trailing, and mining. Recreation has increased over the years and so has the need for roads to safely transport travelers through the Forest. According to the section of this document Describing the Situation, 45% of the planned road reconstruction has not been accomplished during this planning period (since 1985). When road maintenance is not kept up-to-date, traveling across the Forest will be less comfortable. The result could be that many users will choose the better-maintained roads thereby increasing use pressure on those roads and the surrounding areas.

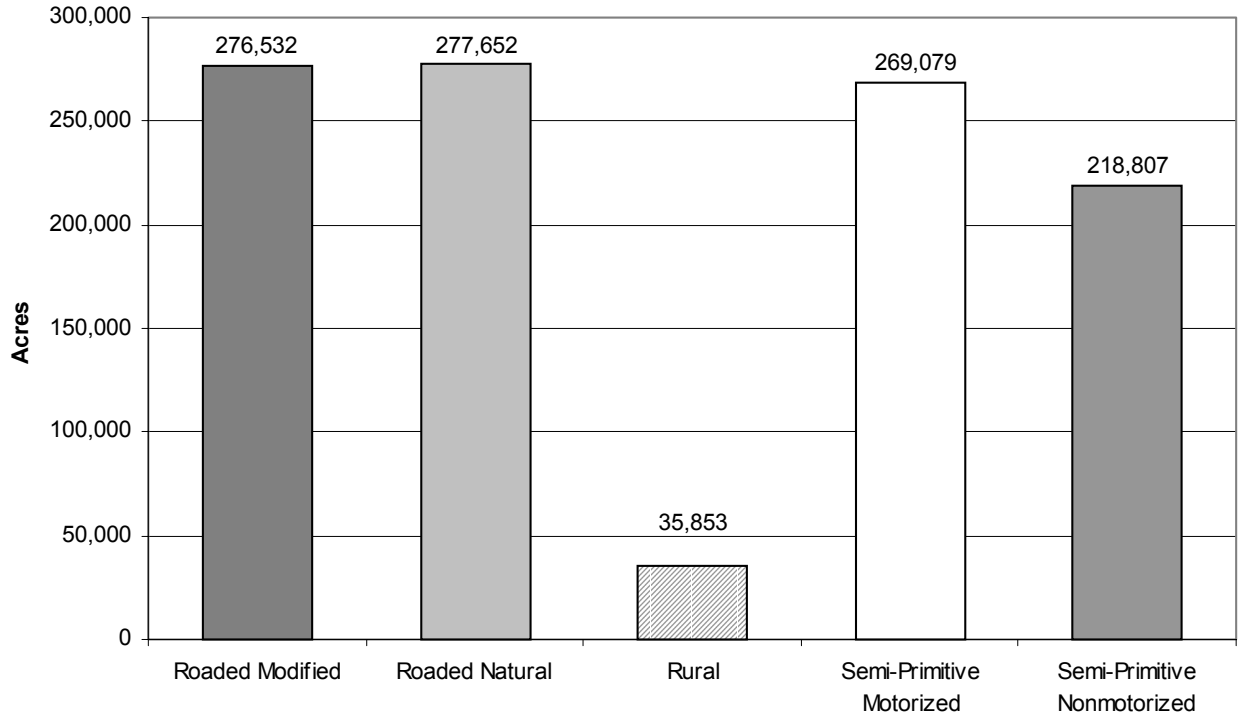
To evaluate the unroaded and roaded recreations opportunities, we looked at the roadless inventory and the Recreation Opportunity Spectrum (ROS) for the Forest. The roadless inventory and the ROS use different criteria. The roadless inventory describes the condition of the landscape without considering recreation. The ROS describes the condition of the land relative to the needs of recreationists.

Recreation Opportunity Spectrum (ROS)

The ROS is used to describe the recreation opportunities available on the landscape. It defines recreation areas based on different settings that provide different experiences. The presence of roads and the distance from roads are two criteria for determining an area's ROS class. The mix of ROS classes on the Medicine Bow National Forest (see the following figure) does not include Primitive or Urban opportunities. Eighty percent of the Forest is considered to be roaded, but not all roads are available for recreation. Twenty six percent of the Forest is in a Roaded Modified (RM) class. RM areas are not managed for recreation but are heavily managed for other activities, usually timber harvesting. After several years, these areas may provide semi-primitive recreation opportunities if the trees are not harvested again and the timber harvest roads are not used.

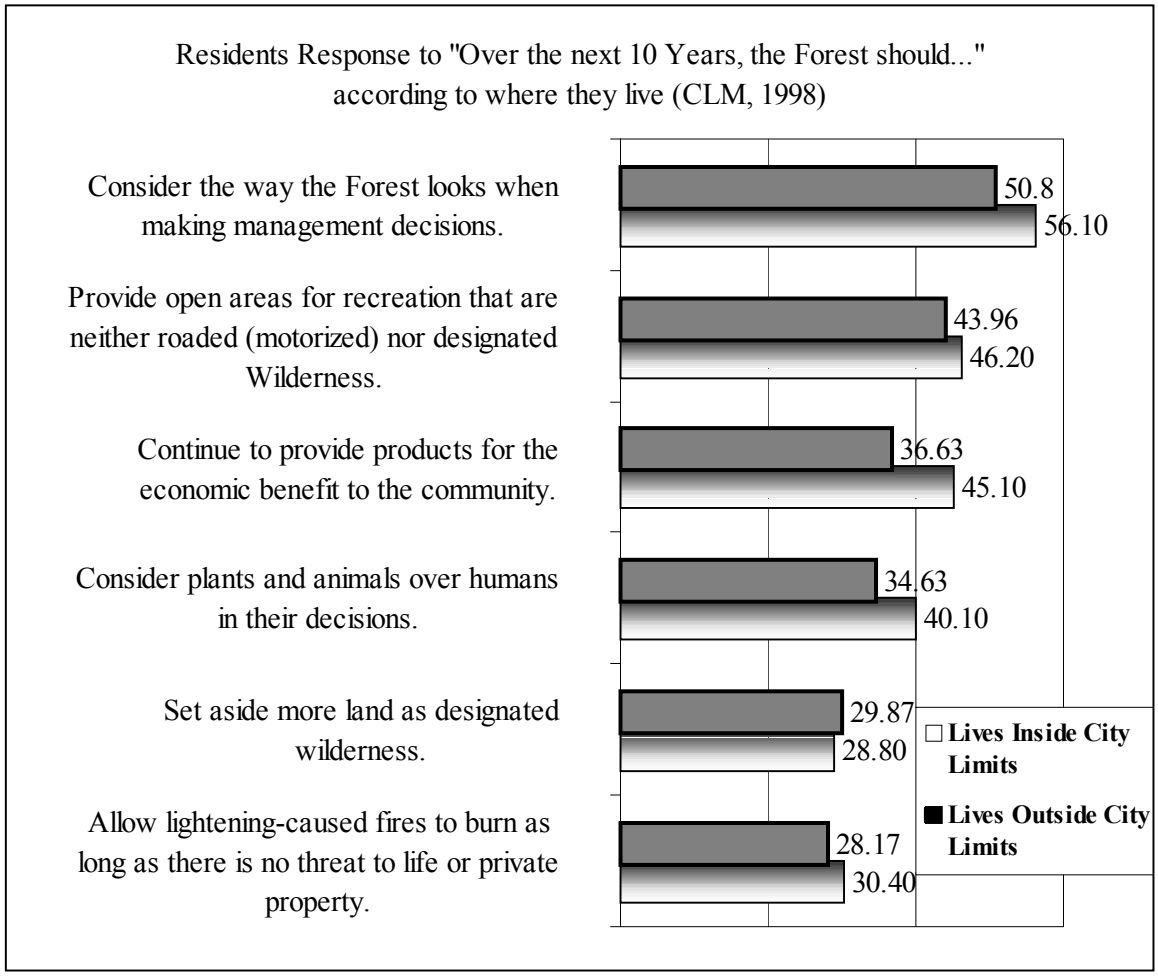
The Semi-Primitive Nonmotorized (SPNM) class is important for nonmotorized recreation in an unroaded setting. All nonmotorized activities are allowed in a SPNM ROS setting, but use generally needs some trails. Most visitors aren't comfortable "bushwhacking" through the timber.

Figure 1. ROS classes on the Medicine Bow National Forest.



A study of residents around the Forest identified a need for additional nonmotorized recreation opportunities outside the wilderness (County Land Management Study 1998). The nonwilderness, nonmotorized recreation setting allows mountain biking, which is not allowed in wilderness areas. These same respondents also identified a need for more designated wilderness, which currently accounts for 7% of the Forest's land base of the. The average percent of wilderness in the Region is 10%. Responses to one of the survey questions are displayed in the following figure

Figure 2. Response to survey question about management of the Medicine Bow National Forest.



Mountain biking has increased dramatically since the late 1980s. Nationwide, participation rates are expected to increase 60% or an average 1.2% per year over the next 50 years (Bowker et. al. 1999). Mountain bikers use roads where there is a lack of trail opportunities. Trail users prefer a variety of opportunities along a trail, so it is important to consider the ROS and preferred experiences when identifying roads for trail uses.

Horseback riding and hiking are probably the most compatible trail and road activities. In fact, many areas that are otherwise inaccessible by vehicles or bicycles are very accessible by horseback or on foot. Participation rates for both activities are expected to increase over the next 50 years: 60% for horseback riding and 59% for hiking. This is an increase of more than 1% per year, with an equal increase in trips taken and days spent (ibid).

The Semi-Primitive Motorized (SPM) setting offers access on level 1 and 2 roads and no facilities in a backcountry setting. This classification is generally used to describe a primitive motorized trail corridor rather than a large area.

Currently, there aren't enough designated motorized trails on the Forest: only 100 miles defined as off-road vehicle (ORV) trails, however there are 1,197 miles of level 1 and 2 roads, most of which do not restrict use to ORVs, or any other type of trail use. An ORV registration bill was passed during the 2001 state legislative session. The bill authorizes the state to sell ORV registrations. Money from the registration sales can be used for trails, including signing and maintenance. The trail has to be part of the state ORV trail system. This program is being managed by the state trails program, which also grooms snowmobile trails across the Forest. The program has the potential to bring in some maintenance funds for trails not currently being maintained.

Because it is illegal to ride an ORV (that's not street-legal) on roads used by other vehicles, there is a need to designate trails specifically for ORV use, preferably in areas near camping opportunities where a variety of trails could be linked. Prior to designating roads as single-use, it is important to understand that not all roaded and unroaded recreation requirements are the same. Numerous trail uses can occur on both roads and single-track trails. Motorcycle riding, mountain biking, hiking, bird watching, and hunting are not dependent on trails, but each of these activities require varying degrees of challenge, trail length, loop opportunities, and scenery.

ORV and 4-wheel drive users like the SPM setting for hunting and fishing. Big game hunting is a traditional activity on the Forest; nearly 28% of local residents hunt elk (CLM 1998). People who commented on the Travel Management Environmental Analysis wanted fewer restrictions on motorized use for game retrieval (2000).

A Roaded Natural (RN) ROS class describes an area with level 3 and 4 roads, that provide ease of access to other, less developed areas (arterials). Sightseeing on level 4 roads occurs in the RN and Rural settings, but opportunities are declining as maintenance decreases on arterial and collector roads and as logged areas, which once provided openings for viewing, are filled in with new growth. Days spent sightseeing are expected to increase 75% by 2050, an average 1.5% per year, with the number of trips taken increasing by 90% in that same time period (Bowker et. al. 1999).

Developed facilities provide a higher level of visitor comfort. Most of the campgrounds on the Forest were constructed in the 1960s. The 1960s campground road and spurs were designed so that the camper backed in to the campsite. Today's recreational vehicles include 60-foot motorhomes that require more space for parking and pull-in, rather than back-in, site design. The space requirements of today need to be re-evaluated.

Geographic Divisions

Pole Mountain

According to traffic count records, the highest volume of traffic occurs on one of the smallest pieces of Forest, Pole Mountain, and on 47.6 miles of road. Most of this area is in a Roaded Natural ROS setting (see Figure 3) where encounters with other recreationists are common. The road system allows visitors to disperse throughout the mountain. Nearby residents from Colorado, Cheyenne, and Laramie use this area nearly year-round. For many locals, Pole Mountain is like a large rural park. The climate allows snow-free access in the spring through late fall. Many users don't wait for roads to fully dry out and often get stuck. This makes road maintenance difficult but even more essential.

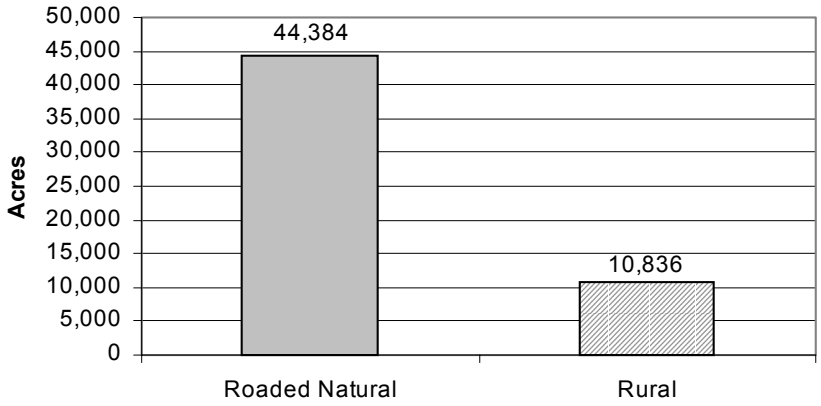


Figure 3. ROS classes on Pole Mountain (2001 inventory).

Laramie Peak

There are few public Forest Service roads in the Laramie Peak division, which is a patchwork of mixed ownership. ORVs and four-wheel drive vehicles are practical modes of transportation in an area that's generally inaccessible for recreation with only a few routes that allow sedans or low-clearance vehicles. Thirty-three percent of Forest Service lands are considered roaded and/or motorized, but many of these acres are actually located inside the boundary of a ranch and can't be accessed by the public. The land exchange program is an award-winning program, but acquiring access is a long, arduous process. Recreationists have become frustrated with the lack of access afforded them by landowners and with the Forest's new travel management plan, which limits motorized use to designated roads and trails. Over the years, new trails have been built in this division, including some motorized trails. Figure 4 displays the ROS classes in the Laramie Peak division.

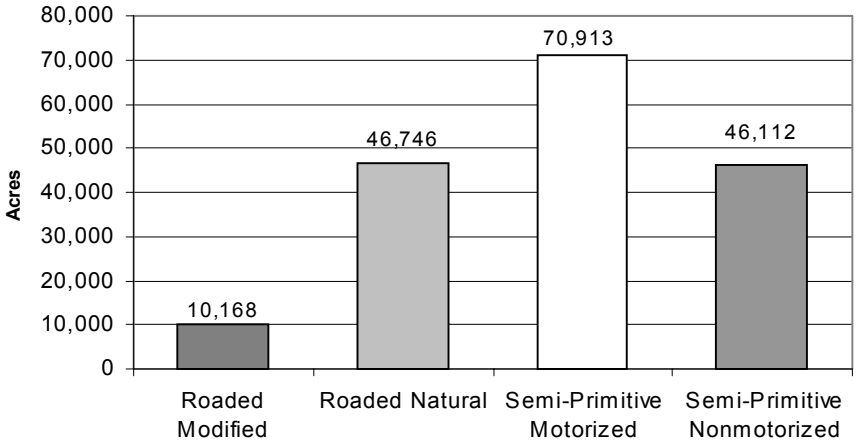


Figure 4. ROS classes in the Laramie Peak Division (2001 inventory).

Snowy Range

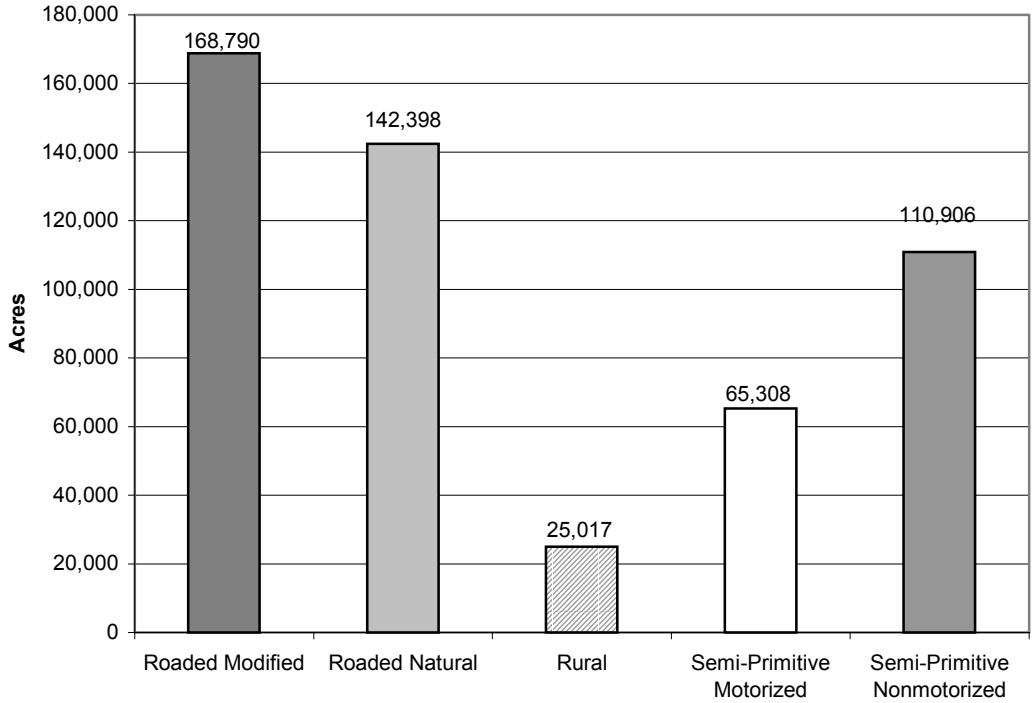
The Snowy Range National Scenic Byway (Hwy 130) provides travelers in this division with access to one of the largest roadless areas (29,637 acres) on the Forest. It also provides access to a variety of quality recreation opportunities, including unroaded nonmotorized trails, picnic and camping areas, and vistas. Traffic on this part of the Forest accounts for 61% of total road use. Sixty-six percent of the Snowy Range is roaded (see following figure). Although road (all maintenance levels) densities are high, most roads are inaccessible or closed to visitors. There is a series of gated timber roads along the Sand Lake Road that provide opportunities for dispersed camping or trail use.

Thirty four percent of the Forest is in a semi-primitive condition, which includes motorized, nonmotorized, and wilderness (7%). Traffic on this part of the Forest accounts for 61% of total road use. Most users access this division from the east side. Recreation use is heaviest around Medicine Bow Peak and within the Snowy Range Roadless Area. Most use originates from the Lewis Lake parking lot. Once the parking lot fills up, users will park down the road nearly a mile. Use typically begins well before the Forest officially opens the area to the public. This area is so popular that other opportunities should be developed to disperse some of the use. The Sheep Mountain or the Rock Creek Roadless Areas are two options.

The Rock Creek Roadless Area on the northeast edge of the Snowy Range was originally part of a planned project, which would have extended the Fallen Pines road into the Three Mile drainage. The project has since been shelved. Hunting is the main use of the area. The Sand Lake Road runs the length of the roadless area; there are numerous old short timber roads in this area, which could be considered for trailheads or campsites. Unauthorized motorized use through the Roadless Area is a threat to the roadless character of the Rock Creek Roadless Area.

Another opportunity exists on the north end of Sheep Mountain. This would entail negotiations with a private landowner that has exclusive access on a road inside the Forest boundary.

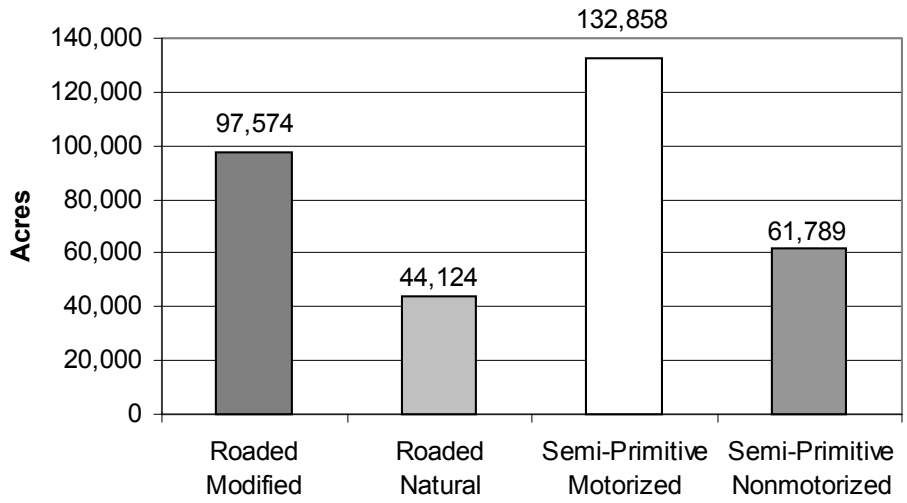
Figure 5. ROS classes in the Snowy Range Division (2001 inventory).



Sierra Madre

This mountain range currently provides good opportunities for roaded and unroaded recreation. Eighty two percent is in a roaded condition, half of which is semi-primitive motorized (see following figure). Of the unroaded acres, 66% is in wilderness and is accessible from the main highway. Roaded recreation occurs on stock driveways and old mining and timber roads. There are two trails into the Huston Park Wilderness from the south. These trails are only accessible from 4-WD roads. The trailhead is located six miles from the actual wilderness boundary. Although use in Huston Park Wilderness isn't heavy, there is an opportunity to evaluate these trails and possibly disperse use into this area from the north by upgrading the roads.

Figure 6. ROS classes in the Sierra Madre Range (2001 inventory).



Opportunities to Address Potential Recreation Problems

When converting roads to trails, consider the needs of different user groups, and use types:

Motorized users and mountain bikers can travel farther than hikers, but mountain bikers would travel shorter distances than motorized users on the same corridor. These distance factors need to be considered when converting roads to trails for recreation. Motorcycle trails are narrow, and riders prefer not to ride on old roads unless the roads have been turned into a single-track with ripping and/or rock placement.

Prior to designating roads as single-use, it is important to understand that recreation requirements are not the same. There are numerous trail uses that can occur on both roads and single-track trails. Motorcycle riding, mountain biking, hiking, bird watching, and hunting are not dependent on trails, but each of these activities require varying degrees of safety, challenge, trail length, loop opportunities, and scenery.

Motorized recreation is a fast way to get through the backcountry, but users need to have a destination, such as a fishing hole or a variety of viewpoints. Most users aren't excited about just riding through clear-cuts and stands of trees, and then back again. The challenge of the ride is important. This is a use type where users' ages vary from late 60s to early teens. Many OHV users spend time in favorite areas, especially where they are familiar with the road system and other nearby opportunities.

Developed Facilities

Guidelines for reconstruction of a campground:

- Consider re-designing some of the spurs into pull-through loops that provide for at least 60' of vehicle off the main road.
- Clear trees where they obstruct the turning radius required by longer vehicles.
- When changing campground road systems, consider resurfacing.

Nonmotorized Trails

Guidelines for opening and signing level 1 and 2 roads for mountain biking, horseback riding, and hiking:

- Look for opportunities to provide loop trails (long and short). Consider enhancing the opportunity with a view or a variety of terrain.
- Enlist the help of these trail users when designing for these opportunities.
- Develop at least a pull out parking lot and sign with a map at the trailhead.
- Make mountain bike and horseback trails should be slightly longer (by 2/3) than hiking trails.

Motorized Trails

Guidelines for designing a motorized trail system out of the level 1 and 2 roads:

- Consider the users and their preference for features along the trail and at the end of the trail.
- Consider motorcycle riders' preferences for single-track trails, which can be developed by placing rocks or ripping through one of the lanes on a two-track road.
- Develop adjacent trail systems so users aren't loading and unloading multiple times during one day
- Consider the legal requirements that OHV trails be exclusive. Wyoming state statutes require users to have street-legal machines before they can ride on trails shared by other motorized vehicles.

UR2 and RR2: Is developing new roads into unroaded areas, decommissioning of existing roads, or changing the maintenance of existing roads causing substantial changes in the quantity, quality, or type of unroaded (or roaded) recreation opportunities?

Few roads have been built in unroaded areas since 1990 nor have any level 3, 4, or 5 roads been decommissioned or obliterated during this time. Due to a lack of funds and resources, many roads haven't been maintained regularly. Over time, increasing or decreasing regular maintenance can change the frequency and patterns of use. Roads that provide the opportunity for pleasure driving should be pleasurable to drive on. Decreasing maintenance due to funding shortfalls means the intended comfort level may no longer be experienced on these roads, and over time, they might become unusable for sedans.

Increasing maintenance on level 3 roads changes the use and increases user access and use levels. The potential to increase opportunities for roaded and unroaded recreation is dependent on funding and public input. Traditionally roads have been paid for and built to access timber sales or mining activities. If the public no longer supports these management activities, funding for road construction would have to come from another source—recreation, for example. In other cases, existing road systems can be rehabilitated to help facilitate recreation by providing loop opportunities or access to trailheads.

As discussed above, additional access to the Forest would improve recreation for users in the Laramie Peak area, as would providing access to the north end of Sheep Mountain and to the northeast end of the Snowy Range.

UR3 and RR3: What are the effects of noise and other disturbances caused by developing, using, and maintaining roads on the quantity, quality and type of unroaded (and roaded) recreation opportunities?

This is not a programmatic issue, and it will be dealt with as site-specific analyses warrant.

*** UR4 and RR4: Who participates in unroaded (and roaded) recreation in the areas affected by constructing, maintaining, and decommissioning roads?**

UR5 and RR5: What are these participants' attachment to the area, how strong are their feelings, and what are alternative opportunities and locations available?

All Forest users travel the arterial/collector roads (level 3-5 maintenance levels). Level 2 roads, give dispersed recreationists access into otherwise inaccessible areas. Many bicyclists and horseback riders, for instance, use these roads for riding. Road decommissioning would be contentious for these users, depending on the road. Conversely, some users would not welcome a road into their favorite roadless area. A 1990 proposal to log in the Rock Creek Roadless Area was unacceptable to a local environmental group and their followers, and the proposal was subsequently dropped.

Comments received during the Forest Plan scoping meetings and answers in the County Land Management study (CLM 1998) indicate that most users have a favorite location on the Forest. The Medicine Bow National Forest is like an oasis in southern and eastern Wyoming; miles of short grass prairie surround the Forest, which is visible from most major highways in the area. Local residents have commented that if it weren't for the Forest, their communities would be dying because some local economies are very dependent on tourism and the draw of the National Forest.

Note: UR4, RR4, UR5, and RR5 have been combined under advisement of the Regional team.

UR6 and RR6: How does the road system affect the Scenic Integrity? How is developing new roads, decommissioning of existing roads, or changing the maintenance of existing roads into unroaded areas affecting the Scenic Integrity?

Two roads on the Medicine Bow National Forest are rated as Scenic Integrity Concern Level 1, with a high degree of interest on scenery. They are the Snowy Range National Scenic Byway and Battle Highway. These roads are easily traveled and offer outstanding views of both natural and natural appearing landscapes.

Most maintenance level 3-5 roads on the Forest are rated as concern levels 1 or 2. There are some maintenance level 2 roads in the semi-primitive motorized areas that are rated concern level 1. However, most maintenance level 1 or 2 roads have a concern level of 3 with a low degree of interest on scenery.

New roads can affect scenic integrity when viewed from the adjacent existing concern level 1 or 2 road. An improperly designed new road with fresh cut and fill slopes would reduce scenic quality. Scenic integrity will be addressed as new road construction, reconstruction, or decommissioning is proposed, if raised as an issue in the site-specific roads analysis. Reducing the maintenance of roads can result in visible erosion damage, which decreases scenic integrity. Increasing road maintenance can ensure better protection and preservation of the scenic integrity within the road corridor.

Passive-use Values

The R2 Regional Office combined PV 1-4 into the following question:

PV3: Who currently holds passive use values and what will be the potential effect, positive and negative, of building, closing, or decommissioning roads on passive-use values?

This forest scale Roads Analysis is an inventory of road uses and conditions, not a plan for specific road entry or road closures. This assessment will identify opportunities for building, closing, or decommissioning roads or changing maintenance levels for existing roads.

Passive use values cover a broad spectrum of desires of many diverse populations. On a national scale, many who hold passive use values for National Forest System lands live in urban areas and may never visit a National Forest but value knowing there are diverse resource opportunities on their public lands. Locally, there is a wide diversity of values associated with the Forest and access to resources. In almost all cases, there will be people interested in maintaining an area as roadless, and there will be other people interested in having roaded access to the same area. The Forest Service works to manage and protect resources, keeping a balance of public values.

There are people who hold high passive use values for areas of future road entry and closure. These areas, some with unique physical or biological characteristics, vary across the Forest as do the passive use values people hold for them. Subforest scale roads analyses interdisciplinary teams will explore and highlight passive use values when they perform project analyses based on this Forest assessment. See the answers to questions TW (1) and EF (1) for more information on unique wildlife and ecological characteristics on the Medicine Bow National Forest.

The Medicine Bow National Forest is relatively heavily roaded, especially in the Sierra Madre and Snowy Range Divisions. This is due in large part to an active timber management program during the past several decades. Road building proposals in the unroaded areas in these divisions have resulted, and will likely continue to result, in substantial public controversy from the passive use advocates. This situation reflects the strong feelings of some groups that any road building substantially affects their passive use advocacy of Forest management.

The most active local groups of roadless passive value proponents on the Medicine Bow National Forest are Biodiversity Associates (Friends of the Bow) and the Sierra Club. Local chapters of these groups are in Laramie and Casper, Wyoming. They are involved with all aspects of forest- and project-level planning on this Forest. The administrative record for most NEPA projects on this Forest contain written input from these groups, and they have been actively filing appeals and litigation on numerous forest projects, especially projects that would impact their passive use values. Those groups who hold high spiritual and religious values for the Medicine Bow National Forest often reflect these values on a national scale. Examples of these values can be seen in the activity of national environmental groups.

To a lesser degree, there are individuals, tribes, and loosely organized user groups that hold traditional, cultural, and religious values for the Medicine Bow. The Crow, Cheyenne, and Arapahoe tribes are historic users of the Medicine Bow and are routinely consulted on forest and project analyses. These tribes have strong cultural and traditional ties to the Sand Lake area of the Snowy Range, where their ancestors made their bows from the alder and mountain mahogany in the area, hence the forest name Medicine Bow. These tribal members still visit this area annually and will be consulted concerning all road proposals in this area of the Forest.

Groups that hold symbolic, and to some degree cultural, values for projects that would result in road closure are mostly commodity advocates such as logging and mineral companies, and ranchers, and motorized recreationists. Some descendants of the early tie hackers on the Forest enjoy these historic tie hack areas as an opportunity to revisit their cultural heritage.

The groups and individuals who would most likely believe their passive use values are being substantially affected from road closures or decommissioning would be motorized recreationists. Many people are proponents for maintaining or increasing current levels of motorized road and trail opportunities and maintaining roads for future forest management activity. These users would feel their values threatened by any proposals to close Forest roads and trails to motorized use.

Many of the grazing permit holders on the Forest also enjoy passive use values when they are working their livestock. Many permit holders have switched from horse use to ATV use as part of their livestock operations. This user group would likely feel that road closures and decommissioning would have a substantial affect on their passive use values for motorized access.

There are many passive use values to consider in forest management. Several have been highlighted above but will need to be explored in more detail at the subforest level analysis.

Social Issues, Civil Rights, and Environmental Justice

SI-1: What are peoples perceived needs and values for roads? How does road management affect people's dependence on, need for, and desire for roads?

People in Wyoming are used to driving to their destinations because people and places in the state are so far apart. Roads are used to transport goods and access recreation and commercial opportunities. Well-maintained roads facilitate recreation and other experiences; poorly maintained roads make them unpleasant, difficult, or impossible. Roads are not always viewed as beneficial. Many people feel the National Forests have too many roads and no further road construction is necessary. Others view roads as beneficial to their experience and for forest management.

Snowy Range

People want comfortable roads to take to scenic places on the Forest. The Snowy Range road takes a traveler up to an elevation of 10,800 feet to the base of a sheer granite wall of the towering Medicine Bow Peak. This opportunity is especially important for the elderly, young children, and for those with access disabilities. The highway is paved, so it provides for comfort as well as convenience. The Snowy Range road is important to local citizens and tourists, in both summer and winter. As a State Scenic Byway, the road is featured in national publications and is advertised on billboards along Interstate 80.

Sierra Madre

By contrast, the Battle Highway (Hwy. 70) can be considered the highway that went kicking and screaming into the 20th century. In the mid to late 1980s, residents in adjacent communities fought the Federal Highway Administration's decision to pave this highway. Opponents were concerned that once it was paved, people would flock to the area and ruin their favorite solitary spots along the road. That didn't happen, but in 1995, a contingent from the State Departments of Transportation and Tourism, a local legislative representative, a representative from the merchants association, a representative from the landowners association (representing private lands in the middle of the highway corridor), and the Forest Service traveled across the highway to consider it for Scenic Byway designation. They made the decision to leave designation up to the local community, especially since the advertising would attract more people to the area. The group felt that tourism planning and Scenic Byway designation had to work in tandem.

Ultimately, paving made a difference in people's use of the road. It made driving a more enjoyable experience for many people. The paving also improved transportation of goods and services between Baggs, WY and Encampment, WY. In addition to commercial and local traffic, the surface upgrade of this road has made it easier for people to view the spectacular fall foliage in the area known as Aspen Alley.

Pole Mountain

Happy Jack Road between Cheyenne and Laramie was upgraded to today's standard in the early 1980s, and it now-runs nearly parallel to Interstate 80. For many travelers, it is the preferred route between Cheyenne and Laramie. The scenery is outstanding and adds to the value of this trip. This road provides access to the private homes that line the east edge of the Forest.

Laramie Peak

The county road system provides the people around Laramie Peak with most of their legal access. Most of the National Forest roads branch off the county roads. The landownership pattern in this area is intermingled federal and private. Roads across private land serve a limited few, so the roads that provide public access receive a great deal of use. County road and bridge departments have a difficult time maintaining the few miles of roads, because of the high level of use.

SI-2: What are people's perceived needs and values for access? How does road management affect people's dependence on, need for, and desire for access?

Most of the major roads in the Forest were built to access a mining claim or to harvest timber. Once people have legal access by road to an area, that area becomes somebody's favorite place.

According to the latest census, the population in communities around the Forest is aging (Social Assessment for the Forest Plan). There is an influx of retirees moving into the area from other states, and they've asked for developed access points, identified trails, and better facilities. While some in the older age group prefer easier access to their favorite recreation spots, others want to get to a trailhead and discover the backcountry. In either case, a well-designed road system is imperative for their access.

Laramie Peak

There is limited legal public access to many NFS lands in the Laramie Peak division. Hunters depend on a certain amount of access to get to their hunt area. If access to an area becomes unavailable, the hunt may not take place as planned. The few roads that access the Forest increase in value as use becomes heavier because all visitors are restricted to a few areas. People who hunt in this division are frustrated with the limited access because they feel they're being forced to pay adjacent landowners for access they didn't have to pay for in the past (from the interviews for the Social Assessment for the Forest Plan). Absentee landowners are refusing to honor these hunting access "agreements" with locals.

Sierra Madre, Pole Mountain, and Snowy Range

Year-round accessible recreation opportunities are important to nearly all residents in the high plains around the Forest. Getting to the Forest and to favorite spots is extremely important, as evidenced by the list of favorite sites mentioned in the County Land Management (CLM) study. Those sites can be found in the appendices to the study.

SI-3: How does the road system affect access to paleontological, archaeological, and historical sites?

All known historical, paleontological, archaeological, and historical sites along the arterial, collector, or local roads have been recorded, and many have been excavated. Some sites have been identified for public appreciation with interpretive signs, such as the tie hack cabins found along the Hog Park Road.

***SI-4: How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites), and American Indian Treaty Rights?**

SI-9: What are the traditional uses of animal and plant species within the area of analysis?

The road system neither prohibits nor encourages plant gathering by indigenous peoples or access to traditional sites. There are no specially designated areas that allow for or prohibit American Indian use. The tribes are consulted on a regular basis for projects and will be part of the forest plan revision.

Hunting and fishing can be considered traditional uses of animal species. Hunting is both facilitated and hindered by roads. Illegal use of roads is a concern for many hunters who may track big game for several miles on foot only to meet someone using a motorized vehicle (OHV or 4WD) on a road that is not open to motorized vehicle use. Motorized use of roads is not necessarily helpful when tracking game; however, roads are useful for packing an animal out of a remote area.

**** SI-4 and SI-9 have been answered together, as recommended by the Regional team.***

****SI-5: How does road management affect historic roads??**

The only historic road on the Forest was the old Snowy Range road, which was re-routed and re-seeded when the newer highway corridor was built in the mid 1980s. This old roadbed is still visible from some points on the highway.

*** This question was re-worded by the Regional Social Scientist.*

****SI-6: How may local community social, and economic health be affected, positively and negatively, by road management (for example, lifestyles, businesses, wood products, tourism industry, infrastructure maintenance)?**

Road management is subtle, yet necessary to Forest management. Use of the Medicine Bow National Forest is dependent on proper, timely road management. Commodity users rely on the existing road system, just as pleasure seekers. For many communities in the West, the road system is the backbone of commerce, providing for the movement of products and people through the Forest. Most of the roads on the Forest were built to facilitate log hauling, and logging trucks used to be visible on many of the main roads. Today, the Forest is selling less timber, but the roads are just as busy as recreation traffic increases. The proximity of the Forest to I-80 and the Colorado Front Range makes tourism an important part of maintaining a more diverse economy for communities around the Forest.

Recreation traffic includes local and non-local users, many of whom are sight seeing. Across the National Forest system, managers have indicated that nearly 40% of Forest use is by people who never get out of their vehicles. In 1998, residents in four local counties were asked how many times they had visited the Forest during the previous 12 months. The following table illustrates their response to this question.

Table 13. Number of times residents visited the Medicine Bow National Forest in 1997 (from CLM, 1998).

Number of times you visited the Forest in the last year	Albany	Carbon	Converse	Platte
Zero Times	1.7%	1.4%	10.6%	15.7%
1-2 Times	8.6%	12.9%	23.9%	28.7%
3-5 Times	19.4%	22.7%	21.2%	28.4%
6-10 Times	22.3%	18.0%	15.5%	14.8%
11 Times +	45.8%	43.6%	25.8%	10.5%
No Response	2.2%	1.4%	3.0%	1.9%
Total	100%	100%	100%	100%

It's clear from these numbers that the Forest is the backyard for many residents. Nearly 70% of the residents from Albany County said they visited the Forest six times or more during 1998, and 60% of Carbon County residents had visited the Forest that many times.

For some local recreationists, tourism traffic has become more of an annoyance than the periodic logging trucks. Tourism is a double-edge sword; for every comment that tourism is a benefit to the economy, there's a comment that "we don't need the crowding."

In addition to increasing uses, the demographics in the U.S. indicate an ever-increasing urban population (NSRE 2001). These travelers expect to go long distances in short amounts of time and to be able to get through the Forest in comfort. With the exception of the state highways, there are no paved roads on the Forest. However there is a prevalence of level 4 and 5 (built for comfort) native surface and gravel roads. Maintenance is increasingly important to facilitating the demands of these users, who are replacing commodity production in the overall economic health of local communities.

Laramie Peak

In Platte County where there are very few acres of NFS lands, county roads are the only access routes onto the Forest east of Laramie Peak. The previous table illustrates the number of times residents from Platte and Converse Counties visited the Forest during the previous year. The infrequency, relative to Albany and Carbon County resident visitation, reflects the lack of access to the Forest in the Laramie Peak area. The few roads providing access into the area are heavily used, not only by recreationists, but by landowners, and commodity users, as well. The added impact of normal wear and tear on these roads has to be absorbed by the county road department, because most Forest roads become county roads, once they exit the Forest. This increases road and bridge maintenance expenses, without the proportional income from federal funds, due to the small acreage contained therein. The County Commissioners are currently working with the Forest to develop better maintenance agreements.

SI-7: What is the perceived social and economic dependency of a community on an unroaded area versus the value of that unroaded area for its intrinsic existence and symbolic values?

or SI-7: For communities adjacent to the Forest with industries dependent upon Forest –related resources (wood products, mineral, grazing, tourism), what are the local values of currently unroaded areas surrounding the communities? These may include the value of roading the area for continued access to resources, expanded roaded opportunities, or maintaining unroaded areas and opportunities.

Some communities are more vocal than others on this topic and are highly dependent on the diversity of the local economy. See the discussion in UR and RR. For many local people, unroaded areas are there for a few to enjoy and aren't that important, personally. These residents see roads as imperative to the management of the Forest, either for timber production, which supports the sawmills, or for fighting wild fire. In these cases, the opportunity cost of not building roads into unroaded areas outweighs the cost of road development and long-term maintenance.

Other residents believe that the Medicine Bow National Forest has too many roads and there aren't enough unroaded areas. Despite the 319,738 acres of inventoried roadless areas[6] on the Forest, recreationists often complain that they can't walk a mile in any direction from a road without running into another road.

Pole Mountain

Pole Mountain is primarily a recreation and grazing portion of the Forest. Its location between Cheyenne, Laramie, and Ft. Collins Colorado makes it extremely desirable for recreation, and the current road system appears to disperse this use, sufficiently. There are few opportunities to increase the miles of maintained roads, and there is no impetus to close any of the level 3, 4, or 5 roads in this area. Maintenance of the current road mileages is imperative for continuing the dispersal of these users, most of whom are pleasure driving for scenery or just accessing favorite areas for day use activities.

Sierra Madre and Snowy Range

The timber program was important to the local economy of Encampment, Wyoming until the sawmill closed in the mid 1990s. During the five years following the signing of the current Forest Plan, many timber sales were appealed with some plans shelved, especially those planned inside inventoried roadless areas. An environmental group from Albany County campaigned against visual effects of clearcutting, and recreationists began noticing clearcuts while driving on roads built for timber sales. The public became more involved in the NEPA process, and the timber program significantly declined.

Carbon County residents haven't expressed a need for maintaining areas in an unroaded condition. Twenty nine percent indicated they would like to see the Forest set aside more land as wilderness (CLM 1998). This is compared to 44.9% in Albany County, 31.8% in Converse County, and 30.3% in Platte County. Fifty-seven percent indicated they would prefer to recreate in open areas that are neither roaded (motorized) nor designated as wilderness.

[6] Medicine Bow Forest Plan Revision Draft Roadless Area Inventory, 2001

Laramie Peak

Some residents in this area are concerned about the Forest Service designating an area as wilderness or other special designation that restricts use, while others (31%) believe the Forest needs to set aside more land as designated wilderness (CLM 1998). Those in the first group feel special designations will limit the already minimal access for economic production, such as grazing and timber harvesting. The threat of forest fires is also a concern for residents in this division. They experienced a large fire close to one of the main roads in the early 1980s. Then in the late 1990s, another fire threatened several ranches in the area. When the Forest Service was studying a proposal to designate a large unroaded (and inaccessible) area as a Research Natural Area, the community overwhelmingly opposed the idea. The proposal will be re-visited during the Forest Plan revision.

SI-8: How does road management affect wilderness attributes, including natural integrity, natural appearance, opportunities for solitude, and opportunities for primitive recreation?

There are four wilderness areas on the Medicine Bow National Forest. Two are located in the Snowy Range and two are in the Sierra Madre. Together, these wilderness areas account for 7% of total forest acreage on the Medicine Bow National Forest. The only issues relevant to this question are dust and unauthorized motorized use facilitated by the road system.

Sierra Madre

Dust has not been documented as a concern, but it may be a problem in the Encampment River Wilderness, which lies east of the Hog Park Road (FS road 550). The prevailing south and west winds may transport road-generated dust into the wilderness area, especially during mid summer when use in the area is at its peak.

Unauthorized motorized vehicle use occurs in the Huston Park Wilderness during the winter. Law enforcement has been given the authority to pursue trespassers on snowmobile, but the practice is seldom used. This problem occurs in this area because it is so close to the Hog Park Road, which is groomed during the winter as a snowmobile trail. The high meadows in the wilderness area are very attractive to snowmobilers.

Snowy Range

Motorized and/or other unauthorized winter and summer uses are suspected in the Savage Run Wilderness, because of its location next to NFS Road 500, but monitoring has not confirmed that this is a problem.

SI-10: How does road management affect people's sense of place?

People's sense of place is directly tied to the aspects of an area, including the area within a road corridor, that invoke a special feeling or attachment to the area. Factors include the area's vegetation, the amount of sunlight available, the views, the solitude, the opportunities that make it a destination, and the overall familiarity. The road itself facilitates a person's enjoyment of the area by providing for driving comfort, the amount and type of use, and any number of aesthetic attributes visible alongside the road. These attributes are directly related to road management. Any change in road management or the development of a road without taking these things into consideration will create a change in current use.

Examples of these effects include those used in the discussion in recreation (UR-5 and RR-5). If a road is managed as a level 3 and the decision is made to upgrade it, more and different users might begin to use the area. This will change the character for users who consider the area to be special; it will change their experience and may displace current users to other areas for their recreation. Likewise, if a road is currently managed as a level 5 and the decision is made to downgrade maintenance, the road will not be drivable, and the area becomes inaccessible for some current users. This problem is especially evident for the elderly, a group that has used the area for years. Rough roads are hard on bones, and users have to be considered in

these decisions. Because a variety of different people use the existing road system, they need to be considered before changing road management.

This question is best addressed at the subforest scale.

CR1: How does the road system, or its management, affect certain groups of people (minority, ethnic, cultural, racial, disabled, and low-income groups)?

The road system is used by all groups of people. Changes in road management, including closing or decommissioning of any of the roads would have the same effect on all groups of people, including minorities and different cultures.

Chapter 5 Describing opportunities and setting priorities

Problems and Risks Posed by the Current Road System

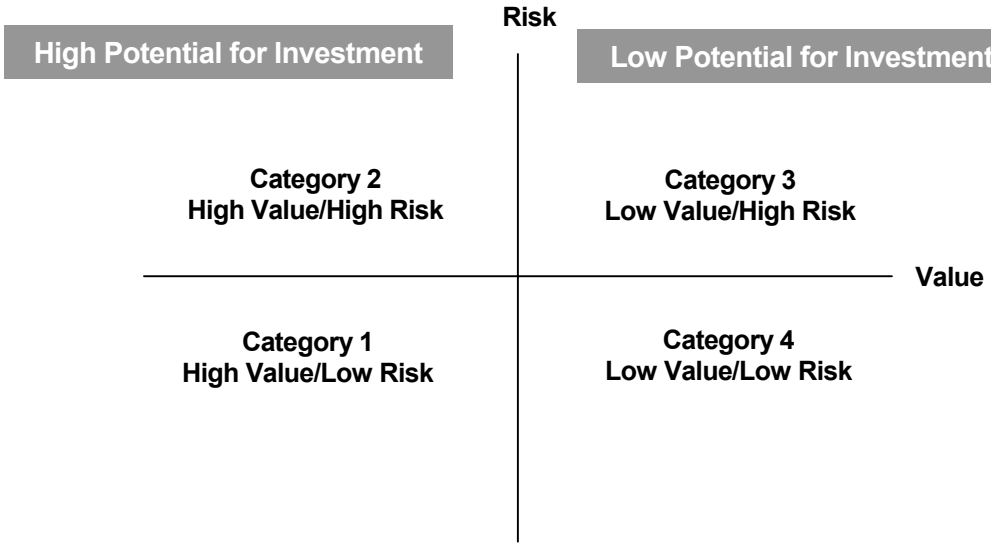
Introduction

To assess the problems and risks posed by the current road system, the IDT evaluated the current maintenance level 3, 4, and 5 road system on the Medicine Bow National Forest using the following tools: a GIS assessment, a road matrix, and a road management graph. There were some inherent limitations in the data used. The available GIS data for each resource area wasn't complete. However, the watershed and aquatics databases were more complete and were adequate for a GIS-based analysis. These were also the resources at most risk from road-related impacts.

GIS Assessment: The effect of roads on the watershed and aquatic resources was analyzed using GIS computer technology combined with the Forest transportation inventory and cartographic feature files. This analysis was not limited to the effects of level 3 through 5 roads. All classified and unclassified roads currently inventoried on the National Forest were included in the analysis. Areas with high road densities were identified and assessed for potential risk to the water and aquatics resources.

The Road Matrix lists every maintenance level 3, 4, and 5 road on the Forest, assigns low, moderate, or high values to resources, and includes annual and deferred maintenance costs. This is a broad assessment, so the detail and accuracy for road risk and values contain a degree of subjectivity and potential for inaccuracies. However, this road matrix provides road-specific information that will help define the potential minimum road system, identify roads that pose high risk to other resources, and prioritize subforest scale projects. As more information becomes available, the road matrix information should be validated and updated.

The Road Risk-Value Graph was developed to display the information in the road matrix. It categorizes the values and risks of the current road system and helps identify opportunities for managing the road system and prioritizing expenditures of Forest road maintenance and improvement funds. This graph is only a management guide; it is not firm direction as it combines many of the road matrix risk and value variables.



Resource Risks versus Road Use Values

The risks and values from the road matrix and the road management graph are defined below.

Road-related Risks

Watersheds and Aquatic Risks: Watershed and aquatic resources were determined to be the resources at greatest risk from road-related impacts. In a given watershed basin, aquatic health depends on watershed health. The GIS assessment compiled the following information by 6th-level watershed. This information was then used to determine watershed risk (see accompanying watershed risk table in Appendix A).

Geologic hazards	Road densities
Soil types	Road proximities to streams
Slopes	Numbers of road crossings of USGS blue-line streams

Each 6th-level watershed was assigned a low, moderate, high, or extreme risk rating. This was intended to guide subforest scale analysis. In a separate analysis, we evaluated the potential effects of level 3-5 roads on watershed and aquatic resources, and the roads were assigned a risk rating.

Wildlife Risks: Many scientific studies have documented impacts to wildlife, including direct mortality, habitat fragmentation, edge effects, viability and sustainability, and nesting and rearing disturbances. The IDT utilized these studies as well as the Forest's annual monitoring reports to evaluate wildlife risks. The monitoring reports clearly demonstrated that the current road system has minimal effects on the management indicator species listed in the Plan. Most of the wildlife risk values assigned to each road on the Forest were low, a few were moderate, and none were in the high category.

More information about road impacts to wildlife on the Medicine Bow National Forest can be found in the TW section of this report.

Financial Risks: Annual maintenance and deferred maintenance costs were included in the risk/value categories for the road management graph. These costs were included to reflect the Forest's financial commitment to maintain the road system and to identify the link between maintenance and resource protection. If basic annual road maintenance (e.g., drainage maintenance) is not performed, roads have an increased potential for loss of investment and environmental damage. The same is true for deferred maintenance, such as replacing major culverts in perennial streams at the end of their design life. A catastrophic drainage failure will have a direct negative impact on the associated watershed and aquatic health.

Road-related Values

Value was determined by looking at resource management use and recreation use.

Resource Management Values: This value was based on two factors: road length and variety of land and resource management access needs provided by the road. Initially, each road was given a default value rating based on its length. Level 3, 4, and 5 roads, 10 miles in length or greater, received a high value rating. Roads from 1 to 9.9 miles in length were given a moderate value. Roads less than 1 mile long were rated low. For the second step, the following criteria were used on a road-by-road basis to adjust the default values up or down:

- Access to suitable timber base.
- Access to private land.
- Existing or potential legal right-of-way to NFS lands.
- Access to high-density urban interface areas (fire suppression) or to known fuel reduction projects.
- Access to key administrative facilities.
- Access to water production or storage facilities.

These criteria were used either alone**,** in cases where one use was very important for management of that resource**,** or in combination where the road served two or more access needs.

Recreation Use Values: The value of recreation use of the road system was rated separately. High values were assigned to roads that provided direct access to developed recreation sites or were key recreation access roads to the Forest. Moderate to high values were assigned to dispersed recreation areas along roads with heavy summer and fall use. Low values were often assigned to roads that provided only seasonal dispersed recreation use.

Road System Modification Options

After performing a road-by-road rating of risk and value based on the established criteria, the following road management categories and graph were developed to display the information and present opportunities for road management. The matrix and watershed assessment provide a basis for subforest scale roads analyses. The graph helps identify roads that make up the potential minimum road system, roads that may need additional investment to protect the resources, and roads that could have their maintenance level reduced.

Road Management Categories and Graph

The following 4 categories of roads were identified based on value and risk. Within each category, there are possible management options for the roads.

Category 1: High Value and Low Risk – Ideal Situation

Options:

- Focus road maintenance funds on these roads to keep them in this category.
- High priority for the Public Forest Service Road designation.
- These roads form part of the potential minimum road system for the Forest.

Category 2 – High Value and High Risk – Priorities for Capital Improvements

Options:

- High priority for subforest scale roads analysis to identify high risk reduction needs.
- High priority for capital improvement funding, such as: PFSR designation, road improvement, road relocation, funding, capital improvement program, etc.
- Shift road maintenance funds to these roads to keep their resource risks from increasing.
- These roads are the remainder of the potential minimum road system for the Forest.

Category 3 – Low Value and High Risk – Priorities for Risk Analysis

Options:

- High priority for subforest scale roads analysis to identify high-risk reduction needs and confirm use value.
- Potential for reducing maintenance level.
- High potential for decommissioning.

Category 4 – Low Value and Low Risk – Priorities for reducing Maintenance Level

Options:

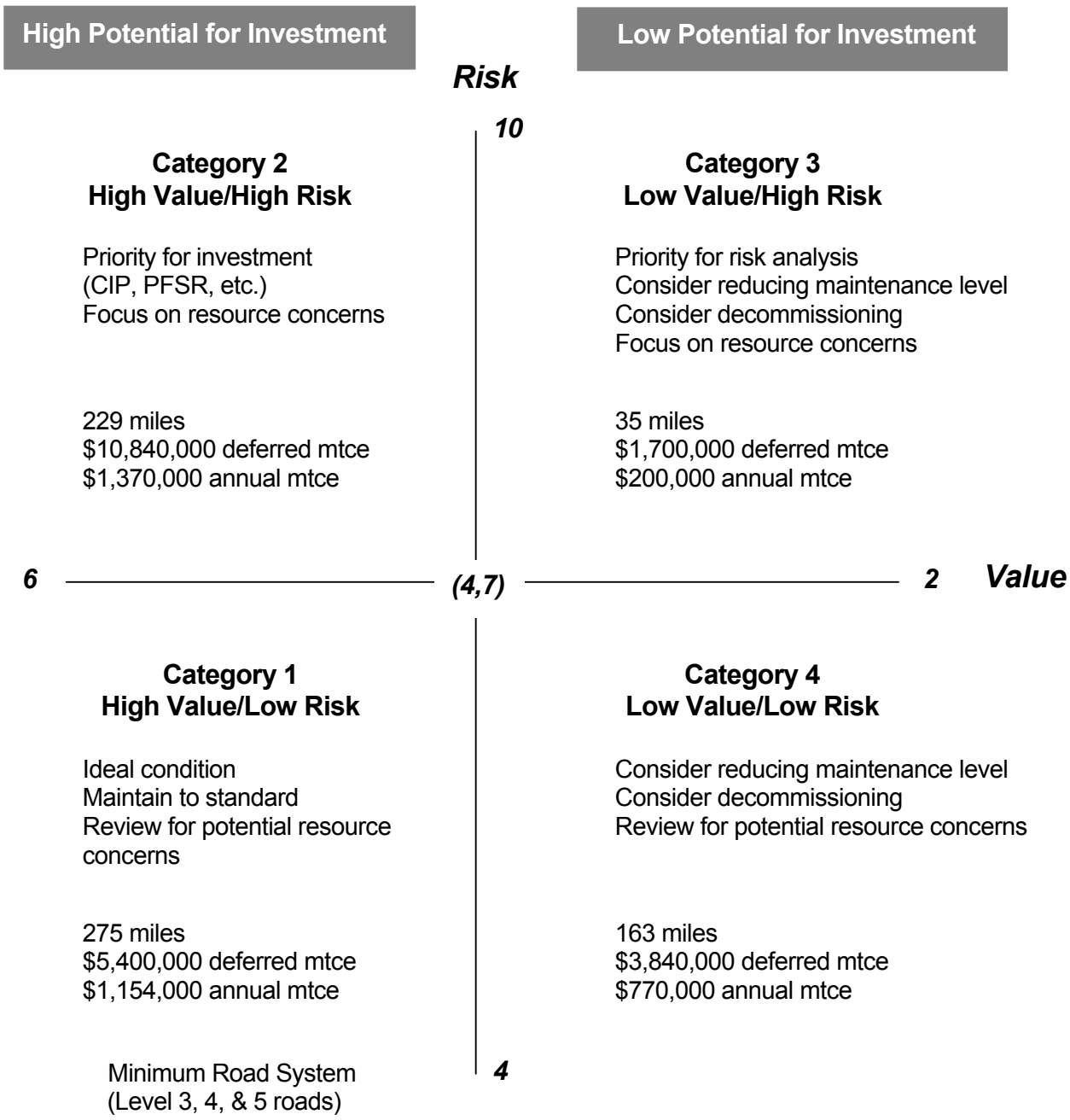
- Lowest priority for expending annual road maintenance funding.
- Moderate potential for decommissioning or reducing maintenance level.
- Where there is a recreational demand, convert these roads to trails.

The Road Risk-Value Graph (see following page) was the tool used to identify roads for the above road management categories. Several factors need to be understood to correctly interpret this graph and the identification of roads in the different categories:

Roads with a value of more than 4 (left side of the vertical axis) represent those roads that constitute the Potential Minimum Road System for management and use of the Medicine Bow National Forest. Those roads with a value of 4 or less are those roads that are potentially not needed for the Forest, at least possibly not needed at their current maintenance level. The situation is similar for the horizontal axis. Those roads with a risk rating of 7 or more represent those roads that may be causing unacceptable resource impacts, while those with a rating of less than 7 are not as much of a resource impact concern.

Of special note, it needs to be emphasized that just because a road falls below the horizontal axis does not mean it is not causing resource impacts. The risk values are a sum of the wildlife, watershed, annual maintenance and deferred maintenance costs. Low costs and higher resource risks could still result in an overall value of less than 7, low risk, on the graph. The road matrix needs to be used with the graph to identify the actual risks that have been assessed through this analysis.

Road Risk-Value Graph



Note: Not to scale.
Value = Recreation value + Resource mgmt value (max = 6).
Risk = Watershed/aquatic risk + Wildlife risk + Deferred maintenance + Annual maintenance (max=12).
Horizontal axis: Value of 4 or less = low potential for investment (low value).
Value > 4 = high potential for investment (high value).
Vertical axis: < 7 = low risk.
7 or greater = high risk.

Road Maintenance Costs – Identification of the Potential Minimum Road System

One purpose of a roads analysis is to identify ways to more efficiently spend the limited road maintenance dollars allocated to the forests. One approach is to reduce or eliminate expenditures on roads that are not needed or not needed at their current maintenance level. The process described above identifies the Potential Minimum (Level 3, 4, and 5) Road System.

Some conclusions can be made by comparing annual road maintenance funding needed for each road to the road maintenance graph on the following page. If all of the roads to the right of the vertical axis were to be decommissioned, the needed annual road maintenance funding for just the level 3, 4, and 5 roads on the Forest would be reduced from $3,494,000 to $2,524,000. The actual allocated road maintenance funding for the entire combined Medicine Bow-Routt National Forests and the Thunder Basin National Grassland has been around $2,000,000/year. If allocated proportionally by miles, this analysis area would receive 40% or approximately $800,000. More road maintenance funding is needed to support the road system infrastructure.

Decommissioning Guidelines

Discussion

Road decommissioning results in the removal of a road from the road system. The impacts of the road on the environment are eliminated or reduced to an acceptable level. To accomplish this, a number of techniques can be used, such as posting the road closed and installing waterbars, posting and installing barriers and barricades, ripping and seeding, converting the road to a trail, and full reclamation by restoring the original topography. There is a different cost associated with each of these techniques and their effectiveness for deterring unauthorized motorized vehicle use varies as well.

Decommissioning level 1 and 2 roads can consist of removing the few culverts, ripping and seeding, posting closed with signs, and installing waterbars to discourage unauthorized motorized vehicle use and ensure proper drainage occurs over time.

Decommissioning level 3, 4, and 5 roads is more expensive than decommissioning most level 1 and 2 roads. When choosing a technique for road decommissioning, the objective is to eliminate the need for future road maintenance.

Level 3, 4 and 5 roads are usually wider than level 1 and 2 roads, have culverts installed at designed intervals to cross drain the road, are ditched, have better sight distances designed on horizontal and vertical curve, have larger cuts and fills, and are designed through the topography rather than with the topography. It is much more expensive to decommission these roads than level 1 and 2 roads. Given the cost, it may be cheaper to maintain level 3, 4, and 5 roads than to decommission them. However, future maintenance costs may not be the only factor to consider; other resource considerations may outweigh the cost. For a particular road (level 3, 4, or 5), high deferred maintenance costs may exceed the costs of decommissioning.

Guidelines:

- Balance cost with resource risk and effectiveness of the treatment when selecting methods for decommissioning roads.
- Convert roads to trails as a decommissiong method when analysis of recreation demand indicates a need to expand, connect or improve the existing trail system in the area. Provide adequate trailhead parking as part of this treatment method (See UR1 and RR1 discussion in Chapter 4).
- Decommission by restoring the road to original contours when mitigating visual impacts is required by the Forest Plan or when necessary to assure the elimination of vehicular traffic.

Capital Improvement Guidelines

Discussion

This analysis revealed that 45% of the road miles scheduled for construction and reconstruction in the 1985 Forest Plan were accomplished. Revision of the plan will reassess the need for previously identified level 3, 4, and 5 road construction.

This analysis does show there is a need to reconstruct existing roads to correct deferred maintenance work items or to improve some roads to meet the increasing use and traffic requirements. Funding limitations require prioritization of reconstruction work. The Road Risk-Value Graph provides a starting point for developing priorities. The following guidelines are to be used in conjunction with the graph when selecting, prioritizing and implementing road reconstruction and construction projects.

Guidelines

- Conduct road location reviews prior to all new construction and road relocations. Assure the location meets public and agency needs while mitigating environmental impacts identified in the analysis. Responsible line officers and resource and engineering specialists should participate in the review.
- Establish a traffic counting program to identify high use roads and traffic patterns.
- Roads with seasonal average daily traffic volumes exceeding 400 vehicles per day should be considered for reconstruction to two lanes.
- Use motor vehicle accident safety investigations and reports to help identify road safety hazards.
- Use the following categories to prioritize road investments planned to reduce deferred maintenance backlog on roads: 1 – Critical Health and Safety; 2 – Critical Resource Protection; 3 – Critical Forest Mission. Data for these work items can be found in the Infrastructure database.
- Coordinate reconstruction and construction work with other agencies whenever possible. Utilize interagency agreements to develop investment and maintenance partnerships.

Road Management Guidelines

- If a road's maintenance condition has decreased, consider the need for the road and the historic use, as well as alternative roads in the area before permanently changing the maintenance level.
- Reduce the maintenance level on identified low value level 3, 4, and 5 roads being analyzed in subforest scale roads analyses. This can be a cost effective alternative. Reduced maintenance of these roads should not result in any increased watershed risks from these roads as the most basic road maintenance will focus on maintaining road drainage. The reduced maintenance should only result in reduced user comfort, and hence, reduced use over time will further reduce the potential for road related watershed risks.
- It is important for travelers to have the sort of information necessary to make a decision about the road on which they're about to travel. When appropriate, utilize entrance treatments, warning signs, route markers, and information bulletin boards to advise travelers of conditions ahead.
- Do not post speed limit and other regulatory signs on roads under Forest Service jurisdiction without a Forest Supervisor's order and a law enforcement plan.

- Consider prohibiting ATV use on Forest system roads when one or more of the following conditions exist:
    - The road is maintained at level 3, 4, or 5 and connects to a state, county or other public agency road that is similarly regulated.
    - Traffic volumes exceed 100 vehicles per day (SADT) on single lane roads.
    - Average traffic speed on the road exceeds 25 mph.
- To reduce annual maintenance costs, implement seasonal travel restrictions on roads susceptible to damage during wet or thawing conditions.
- Collect road maintenance and surface rock replacement deposits as appropriate on all road use permits and special use permits.

General Guidelines

The following are general road related guidelines:

- Require authorized, permitted operations utilizing NFS roads to pay their fair share of road maintenance costs.
- Consider road decommissioning when planning projects that involve the construction and use of short term, single resource roads: for example, roads planned for mineral projects that undergo exploration, development, and abandonment phases. By incorporating decisions to decommission the single resource roads at the end of the project, rather than not addressing this issue up front, the Forest will better demonstrate a commitment to managing its road system toward the minimum road system needed. Document planned decommissioning in road management objectives.
- Develop an annual maintenance plan to prevent deferred maintenance costs from accruing on High Value rated roads
- Update the road system databases and keep them current.
- Use an interdisciplinary process to develop, update, and implement road management objectives for all system roads. Assure that information in the transportation atlas and inventory conforms with approved road management objectives.
- At appropriate intervals, update the data contained in the Road Matrix. Analyze the changes to determine new opportunities that may have developed as new information is collected.
- Incorporate yearly Forest road changes into the annual Forest Plan Monitoring Report (via the forest plan revision process). These road changes can include miles of roads decommissioned (classified and unclassified), miles of roads converted to trail (MV and Non-MV), miles roads reconstructed (by maintenance level), and miles of roads constructed (also by maintenance level).
- Require the use of this Medicine Bow National Forest Roads Analysis for all subforest scale roads analysis through a Forest supplement to the 7700 Manual.
- At least once every 2 years, perform road condition surveys on all level 3, 4, and 5 roads.

Assessment of Building Roads in a Currently Unroaded Area

For this assessment, unroaded areas include inventoried roadless areas and other areas that do not contain roads.

Much of the currently unroaded areas in the Sierra Madre and Snowy Range Geographical Divisions are also within the suitable timber base, and most of these unroaded areas are within inventoried roadless areas. The response to TM 2-3 reveals that 20% of the Forest Plan suitable timberland is in inventoried roadless, or 81,633 acres of the 401,662 acres of suitable timber is within inventoried roadless. Much of the suitable timber outside of the inventoried roadless areas has been roaded and is under some form of recurring timber management. There are still some areas in the suitable timber base that are outside of unroaded areas that need roads for further timber management needs. Most of these needed roads would be managed and operated at maintenance level 1 and 2. Social opposition to these road related proposals can be expected to be high as well.

The situation in the Pole Mountain and Laramie Peak Geographic Divisions is different. The Pole Mountain area contains very little suitable timber or unroaded areas. This area is well roaded and receives very high recreation use. The Laramie Ranger District is working to reduce the number of road miles in this area. The Laramie Peak Division contains very little suitable timberland and about 50% of it is inventoried roadless. The Cold Springs Forest Ecosystem Health EIS initiated in 1996 originally proposed building over 30 miles of mostly low standard roads into the Buffalo Peak RARE II area for a timber sale to reduce insect, disease, and fire risks. This analysis is presently on hold due to changing national direction concerning road construction in inventoried roadless areas.

National direction addressing road building in inventoried roadless areas is needed to help resolve some of these conflicts. Even with such direction, road building in unroaded areas or inventoried roadless areas will most likely result in social opposition and conflict.

Some inventoried roadless and unroaded areas are not conducive to road building due to physical constraints (steep slopes, unstable soils, wetlands). However, in other areas, roads can be constructed after proper project planning, analysis, road design, and mitigation.

This issue will be decided in forest plan revision. It is addressed in specific resource sections in Chapter 4.

Opportunities for Addressing Problems and Risks

Travel Management: For roads in the Low Value rating, either decommission or consider ways to raise this value: for example, by providing recreation opportunities along the road. Overall recreation use on the Forest is increasing and road related opportunities exist to better disperse this use and lessen recreation impacts that are occurring elsewhere. An example of increasing recreation use on a low value road would be to develop a trailhead and trail system at the end of the road. There are many opportunities on the Forest to convert the unclassified and level 1 and 2 roads to motorized and non-motorized trails.

Watershed: The watershed assessment identifies potential effects of roads which can impact watershed condition. Watersheds, and associated aquatic resources, that are at greatest road related resource risk could be prioritized for separate watershed analyses to better identify specific areas of concern that may need repair. Implementation of the October 2000 Medicine Bow National Forest Travel Management EA (road-specific decisions) will take 6 to 7 years to complete for all of the geographic divisions. The results of the watershed assessments can be used to better focus efforts during the geographic division assessments.

The following table identifies extreme and high risk watersheds by geographic division.

Table 14. Extreme and high risk watersheds on the Medicine Bow National Forest.

Watershed Name	Watershed Number	Geographic Division	Rating
South Fork Little Medicine Bow River	101800050102	Laramie Peak	High
Sheep Camp Creek	101800110106	Laramie Peak	High
Sturgeon Creek	101800110408	Laramie Peak	Extreme
Government Gully	101800100605	Pole Mountain	Extreme
Telephone Spring	101800100607	Pole Mountain	High
North Fork Crow Creek	101900090101	Pole Mountain	High
Middle Fork Crow Creek	101900090104	Pole Mountain	High
South Fork Crow Creek	101900090105	Pole Mountain	High
Middle Fork Lodgepole Creek	101900150102	Pole Mountain	High
South Fork Big Creek	101800020301	Sierra Madre	High
North Fork Big Creek	101800020302	Sierra Madre	High
Henry Creek	101800020305	Sierra Madre	Extreme
Little Beaver Creek	101800020802	Sierra Madre	High
Calf Creek	101800021002	Sierra Madre	High
North Fork Spring Creek	101800021304	Sierra Madre	High
Road Gulch	140500030201	Sierra Madre	High
Cottonwood Creek	140500030202	Sierra Madre	High
Sixmile Creek	140500030203	Sierra Madre	High
Hell Canyon	140500030604	Sierra Madre	High
Salt Creek	101800020102	Snowy Range	High
Rob Roy Reservoir	101800020201	Snowy Range	High
Keystone Creek	101800020202	Snowy Range	High
Muddy Creek	101800020203	Snowy Range	Extreme
Lincoln Creek	101800020204	Snowy Range	High
Mowberg Creek	101800020205	Snowy Range	Extreme
Pelton Creek	101800020206	Snowy Range	High
Boat Creek	101800020401	Snowy Range	Extreme
Mullen Creek	101800020404	Snowy Range	High
North French Creek	101800020501	Snowy Range	Extreme
French Creek	101800020503	Snowy Range	High
School Creek	101800020603	Snowy Range	Extreme

Watershed Name	Watershed Number	Geographic Division	Rating
North Fork Corral Creek	101800020606	Snowy Range	High
North Brush Creek	101800020701	Snowy Range	High
South Brush Creek	101800020702	Snowy Range	High
Barrett Creek	101800020703	Snowy Range	High
Draw Creek	101800020704	Snowy Range	High
Troublesome Creek	101800021202	Snowy Range	High
South Fork Badger Creek	101800021500	Snowy Range	High
Pass Creek	101800022001	Snowy Range	High
East Fork Pass Creek	101800022002	Snowy Range	Extreme
East Fork of Little Pass Creek	101800022007	Snowy Range	Extreme
Wagonhound Creek	101800040105	Snowy Range	Extreme
Boswell Creek	101800100234	Snowy Range	High
Jelm Creek	101800100235	Snowy Range	High
Fox Creek	101800100236	Snowy Range	High
Mill Creek	101800100705	Snowy Range	High

Aquatic: the following opportunities address roads impacts on specific aquatic situations, e.g., surface/subsurface hydrology, surface erosion, etc.

The following is a list of opportunities/recommendations to consider if roads are likely to modify surface and subsurface hydrology:

- Design roads to minimize interception, concentration, and diversion potential.
- Design measures to reintroduce intercepted water back into slow subsurface pathways.
- Use outsloping and drainage structures to disconnect road ditches from stream channels rather than delivering water in road ditches directly to stream channels.
- Evaluate and eliminate diversion potential at stream crossings.

The primary opportunities to reduce surface erosion identified in a subforest scale roads analysis include:

- Increasing the number and effectiveness of drainage structures.
- Improving the road surface by either gravelling, or adding a binding material to those roads that have native surfaces with no inherent binder.

Opportunities to address existing roads in areas with high mass wasting potential include:

- Road relocation to an area with more stable soils.
- Relocation of drainage structures so that the outlets are on less sensitive areas which may include flatter slopes and better-drained soils.

Opportunities to improve local channels at road-stream crossings include:

- Designing crossings to pass all potential products including sediment and woody debris, not just water.
- Realign crossings that are not consistent with the channel pattern.
- Change the type of crossing to better fit the situation; for example, consider bridges or hardened crossings on streams with floodplains, and consider bottomless arch culverts in place of round pipe culverts.
- Add cross-drains near road-stream crossings to reduce the connected disturbed area.
- Reduce the number of road-stream crossings to minimize the potential for adverse effects.

Opportunities to reduce the effects of the road system on wetlands include the following:

- Relocate roads out of wetland areas.
- Where relocation is not an option, use measures to restore the hydrology of the wetland. Examples include raised prisms with diffuse drainage such as french drains.
- Set road crossing bottoms at natural levels of wet meadow surfaces.

Opportunities to address road-stream crossings that restrict migration and movement of aquatic organisms include:

- Reset the culvert to eliminate the limiting factor.
- Replace the culvert with an alternative crossing such as bridge, hardened low-water ford, or bottomless arch culvert.

Opportunities to address roads that affect riparian plant communities include:

- Relocate roads out of riparian areas.
- Restore the hydrology in riparian areas that have been dewatered by the road system.

Forest plan revision: There are user conflicts between winter motorized and nonmotorized forest users. We can use this analysis to help develop revision alternatives that provide passenger vehicle access to high-use areas in the winter. The objective is to separate motorized from nonmotorized users in one of two ways: 1) by establishing separate points of departure into snow country for motorized users and nonmotorized users or 2) by providing access to a common starting point for all users and separating the users once they arrive. There is also rising demand for trails dedicated to summer use of all-terrain-vehicles since the October 2000 decision to restrict use of such vehicles to designated trails and designated roads. We may be able to convert roads rated with low value to trails and meet some of that demand while minimizing costs and minimizing adverse resource impacts from new trail construction.

Mountain pine beetle populations have been increasing over the last five years, particularly in the Sierra Madre Mountains. For revision alternatives focusing on keeping insects and disease conditions at endemic levels, this analysis can help compare current access with predicted spread of the beetles and help identify areas where we may need access to treat these infestations.

This analysis provides baseline data for calculating road densities and forest fragmentation. It also serves as a starting point for reducing road densities and fragmentation in alternatives where those long-range reduction goals are set. Road densities and forest and habitat fragmentation are components of biological diversity, which is a major revision topic.

Fuel Reduction: Initiative funding anticipated for the next several years is another opportunity to address growing urban interface wildfire risks. The IDT placed a high resource management values on many of the level 3, 4, and 5 roads that provide primary access to areas around and within the Forest that have high densities of cabins, homes, and other structures. These roads may be important access routes for fuel reduction projects, especially any commercial projects that could involve log hauling, and provide important access for wildfire suppression access and evacuation egress. The IDTs for these fuel reduction planning projects can use the road matrix to begin identifying the existing access/egress situation to help define the road related project proposals.

Deferred maintenance backlog: This Medicine Bow National Forest Roads Analysis clearly demonstrated that annual maintenance funding is inadequate to maintain the road system on the Forest. Over time, these roads will continue to incur additional deferred maintenance costs and degrade unless significant road reconstruction funding becomes available. The agency is addressing this issue nationally by proposing a new funding category for the 2004 federal highway transportation funding authorization called Public Forest Service Roads (PFSR). A challenge for this Forest is determining how to prioritize these roads for the PFSR funding. The Road Matrix Table revealed that some currently submitted PFSR project proposals are for roads that received a low value rating. This table can be used as a prioritization tool for these proposals.

This roads analysis has identified an opportunity to improve road related dialogue with the respective counties. The Forest should continue to pursue formal road maintenance agreements with the counties interested in sharing maintenance to more efficiently use taxpayer funds.

Areas Needing Improved Access

Pole Mountain: The Vedauwoo Glen road (NFSR 700) is a popular road for accessing dispersed campsites and for sightseeing. In 1994, this road received 350 SADT (Average Daily Traffic), nearly 1/3 the amount of traffic on the Snowy Range National Scenic Byway. Information from the recreation database indicates there are 193 inventoried, dispersed campsites on Pole Mountain. As this use increases this road will need to be upgraded to support the additional traffic.

Snowy Range: Roads on the Snowy Range were developed in association with other management activities, such as mining and timber sales. Use on these roads has shifted in the last decade to predominantly recreation. Of the 701 miles of level 3 and 4 roads on the Forest, 401 miles are on the Snowy Range. This road system is extremely important to disperse users from ten main access points, none of which is on the northeast edge of the Forest. Each of these 10 access points provides unique recreation opportunities. Sixty one percent of recorded vehicular travel within the Forest occurs on this mountain range, mostly south and northeast of State Highway 130.

The Sand Lake Road (NFSR 110) has the potential to provide outstanding unroaded opportunities. It dissects two major roadless areas, the Three Mile and Snowy Range Roadless Areas, as well as accessing the Rock Creek Roadless Area. Currently, it is difficult to access the Three Mile area from any direction. The North Fork Trail, Trail 389, Crater Lake, and the Rock Creek Trail are outstanding unroaded, nonmotorized trail opportunities on the Forest.

Laramie Peak: The northwestern portion of the Laramie Peak division lacks adequate access for passenger cars. There is an opportunity to acquire legal jurisdiction over the rest of Box Elder Road (NFS Road 629). Consider improving this road to traffic service level C (mixed traffic design) and maintain it at level 3. Identify this road as a potential Forest Service public road (see Table 3).

NEPA analysis needs

This forest scale roads analysis is intended to be used as an assessment for the revision of the Medicine Bow Forest Plan. This roads analysis does not need any NEPA analysis as it provides information and opportunities for the plan revision, as well as for subforest scale roads analyses. The forest plan revision will be analyzed through the EIS process. Any decisions resulting from subforest scale roads analyses will be required to be supported by the appropriate level of NEPA.

Chapter 6 Key Findings

Forest Scale Issues

Shared maintenance is not occurring on key access roads.

- This issue was addressed with the Commissioners and Road and Bridge Superintendents of Converse, Carbon, Platte, and Albany Counties. While interest in pursuing Road Maintenance Agreements was shared by all of the counties, Converse County did not wish to pursue such agreements at this time. The project file for this analysis contains documentation on the public involvement efforts that occurred with the counties.
- The Forest should continue to pursue formal road maintenance agreements with the counties interested in sharing maintenance to more efficiently use taxpayer funds.
- The Category 1 and 2 roads (from the Road Risk-Value Graph) are the most obvious candidates for Road Maintenance Agreements with the counties. In some cases, the Category 2 roads might need federal capital improvements first before the counties would consider shared maintenance responsibilities.

There is not enough legal public access to the Forest.

- The roads analysis did confirm a lack of access in two areas on the Forest. There is insufficient access into the northeastern part of the Snowy Range division. The 1985 Forest Plan objectives intended to construct roads in this area; those roads were not constructed. There is a conflict between users who want access and those who don't. In the Laramie Peak division, the fragmented landownership pattern restricts public access. 1985 Forest Plan direction focused right-of-way acquisition efforts in the Laramie Peak area. We have successfully acquired public access through rights-of-ways acquisitions and land exchanges; many other public access needs still exist.

Some roads are not under appropriate jurisdictions.

- We don't know the extent of this problem. A preliminary review of the database shows several roads listed under questionable jurisdiction. However, this was based on data that had not been updated as the Forest acquired legal jurisdiction on roads. During their research for this analysis, the Forest lands staff reviewed and updated some of the jurisdiction information in the database. Efforts to update and correct the data files should continue.

Road maintenance funding is not adequate to maintain and sign roads to standard.

- The road matrix developed for this roads analysis contains the annual and deferred maintenance costs for each level 3, 4, and 5 road on the Forest. Even with the focus on potential minimum road system, our current budgets don't cover road maintenance costs. The Medicine Bow National Forest currently receives approximately $800,000 per year for all road maintenance. To maintain the level 3, 4, and 5 road system to standard would cost approximately $3.5 million.
- Using the subforest level roads analysis process could result in continued reductions of the Forest road maintenance obligations through decommissioning of level 1 and 2 roads. However, these reductions will be minor compared to the overall road maintenance needs on the Forest.

Road access may not be adequate for future management needs.

- Arterial and collector roads are not being maintained to the standards specified in the 1985 Forest Plan. The road system will continue to degrade, and this will compromise future access on existing roads.
- Comparing the 1985 Forest Plan with the existing road system revealed that over 40 miles of new road construction and over 80 miles of road reconstruction projected to meet land management purposes did not occur. Most of these road improvements were intended to meet timber stand vegetative treatment needs. On the Medicine Bow National Forest, the timber program still has additional road access needs to meet the 1985 Forest Plan and may very well have additional road needs under the revised plan. Subforest scale roads analyses should focus on road-related watershed improvement opportunities, decommissioning of unneeded level 1 and 2 roads, and upgrading roads to meet current and future management needs.

There are potential environmental impacts from the road system that need to be prioritized and evaluated for future analyses at a subforest level scale.

- This roads analysis process identified individual roads that represented high potential for environmental risks. Categories 2 and 3 from the Road Risk-Value Graph identified approximately 264 miles of these roads. The analysis also identified watershed that are at risk. The process used watershed health assessments as the indicator of aquatic health. The watershed risk table (Appendix A) also identifies those watersheds most at risk. Future subforest scale roads analyses should reference this appendix for risk rating and baseline watershed information.
- Chapter 4 provides more information in response to this issue.

High road densities in some areas of the Forest are causing impacts to resources and users.

- By itself, the level 3, 4, and 5 road system was not a road density concern.
- The watershed assessment considered areas of relatively high road densities[7] as one component of the overall watershed risk ratings. Most of these high road density areas are areas where there are many unclassified roads and level 1 and 2 roads. These areas of high road densities often correlate with high risk ratings. These areas are also opportunities for identifying road conversions into trails to enhance recreation opportunities.

The public was concerned about road-related decisions being made without public involvement.

- The public was concerned that decisions about reducing or reconfiguring the Forest's transportation system might be made without the benefit of public involvement. The roads analysis process doesn't make any road-related decisions. Decisions that will change the existing system will occur through public involvement and a site-specific analysis that considers effects on existing roads or roads proposed for addition, deletion, or reconstruction in the future.

[7] High road densities are defined as 3 or more miles per square mile for the watershed assessment.

Forest Supervisor Guidelines Response

The Forest Supervisor wanted four items included in the roads analysis report. They are listed below in bold with a discussion following.

An inventory and map of all classified (3, 4, and 5 level) roads and a description of how those roads are to be managed.

This report includes three types of maps. The map sets are divided into the Geographical Divisions used for this analysis.

- The first set of maps is of the existing inventoried level 3, 4 and 5 road system, with the road numbers. It also includes the inventoried level 1 and 2 roads without their respective road numbers. The level 3, 4, and 5 roads from the road matrix are displayed on the maps.
- The second set of maps is of the Potential Minimum Level 3, 4, and 5 Road System. These maps display the high value level 3, 4, and 5 roads. The maps, matrix, and graph show management opportunities for the level 3, 4, and 5 roads. In subforest scale analysis, specific road management decisions will be made using this information.
- The third map set displays the 6th level watershed risk assessment on the entire Medicine Bow National Forest. The maps should be used with the Watershed Risk Assessment Table (Appendix A) for subforest scale analysis.

Guidelines for addressing road management issues and priorities related to construction, reconstruction, maintenance, and decommissioning.

- Chapter 5 of this report contains guidelines and opportunities for addressing road management issues and priorities related to construction, reconstruction, and decommissioning.
- Aquatic questions in Chapter 4 identify opportunities for addressing aquatic resource concerns.

Significant social and environmental issues, concerns, and opportunities to be addressed in project level decisions.

- Contacts with the other counties resulted in a mix of potential opportunities. Most of these are the varying interest of these counties to work with the Forest in developing Road Maintenance Agreements for shared road maintenance and eligibility of county roads for federally funded road improvements. We still need to coordinate many details with the counties.
- The environmental issues that surfaced are concerns about the health and condition of some watersheds as a result of road impacts, silvicultural concerns about the current and future health of the forest, and road access for fuel reduction projects and fire suppression, especially in the urban interface areas.

Documentation of the coordination efforts with other governmental agencies and jurisdictions.

- The Administrative Record for this roads analysis contains documentation of the Communications Plan and meeting notes from District Ranger and IDT member contacts with County Commissioners and County road and Bridge Superintendents and copies of newspaper articles on this analysis. This information is on file at the Medicine Bow-Routt National Forests Supervisor's Office in Laramie, WY.